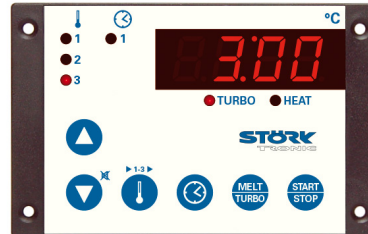


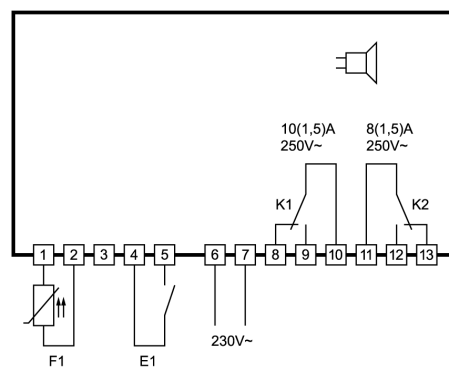
## ST501-QE1TA.09

Deep-frying controller

Order number 900219.092



## Wiring diagram



## Product description

The controller ST501-QE1TA.09 fulfils the function of a temperature controller and is cut to the use with deep-fryers. It has a 4-digit LED display, 6 keys, 2 relays and a switching input. The different temperature setpoints and timer defaults can be parametered directly by the keys.

**Sensor:** multi-resistance input

**Range:** dependent on the type of sensor

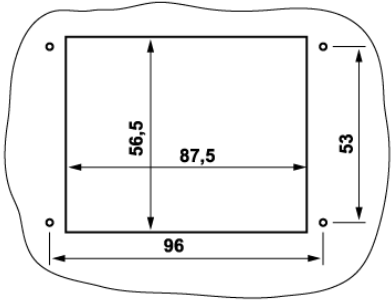
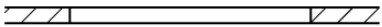
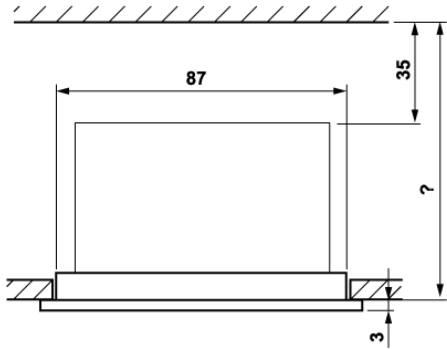
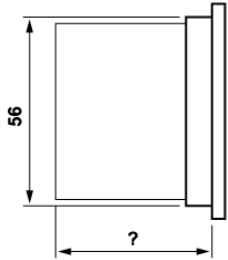
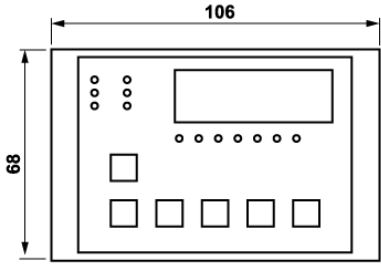
**Front size:** 106mm x 68mm

**Panel cut-out:** 87,5mm x 56,5mm

**Tightness:** front IP64

**Connector:** screw terminal

ST 501 ...



## SOFTWARE .09

### General information

The unit is made of a service board and a separate power board which are linked with a ribbon cable. Both parts form a complete installation unit. All outputs and inputs are connected on the back of the power board. The unit fulfils the function of a temperature controller with timer function and is cut to the use with deep-fryers.

On the front of the unit has a 4-digit 7-segment LED display, 6 keys and 6 LEDs. 3 LEDs identify the selected temperature setpoint relevant for the regulation ("temperature 1, 2, 3"), 1 LED shows the status of the timer ("time 1") and the remaining 2 LEDs indicate the heating mode ("TURBO") and the present status of the control output ("HEAT"). During the timer expires the LED "time 1" flashes, during careful heating the LED "TURBO" flashes. If the LED "TURBO" is off the unit regulates with PID characteristics and approaches the setpoint preventing extreme oscillating. If the LED "TURBO" lights up permanently thermostatic regulation and therefore the utmost heat supply is active.

A temperature sensor is connected to measure the actual value. By means of parameter it is possible to select among Pt100, Pt1000 and PTC as sensor type without circuitry adaptations. Two switching inputs – if available – permit the start of the timer with an external switching key and the activation of a setpoint reduction, which is indicated by a flashing point on the right side of the display. The function of the switching inputs can be deactivated with parameters. The output relays are two change-over contacts. The functions "heating", "control contact 2" or "alarm" can be assigned to each output, even the deactivation of a output is possible.

The controller has the possibility of a particularly careful heating in case the deep fryer fat is not yet melted. This retarded heating process (Melt-function) is always activated after switching on the unit and ends if an adjustable limit value below the setpoint is reached. If the fat is evidently melted you can switch to accelerated heating by pressing the "TURBO" key even before the limit value is reached. During cooling the turbo-mode remains active until the temperature falls below 50 °C. Then the reloading of solid fat is assumed and the controller switches back to reduced heating automatically. The reduced heating mode can be deactivated.

Two adjustable limit values provide a temperature alarm relative to the control setpoint. Boundary and range alarm as well as relative and absolute limit values are possible. In these alarm cases the control process continues. An internal buzzer provides an acknowledgeable alarm signal..

An operating time recording monitors the fat temperature and counts the operating hours with actual values above an adjustable limit value. An alarm message can be activated or a regulation blocking takes place (if activated) to force replacing the deep fryer fat. A reset is only possible in alarm or blocking condition, in addition temperature must fall below a further adjustable limit value. If a regular exchange of the fat is guaranteed otherwise, an unconditional reset of the fat operating time can be enabled by means of parameters.

## Adjustment options



### **Key 1: UP**

Pressing this key you can increase the parameter or parameter value or scroll the parameter list.



### **Key 2: DOWN**

Pressing this key you can decrease the parameter or parameter value or scroll the parameter list. At alarm the buzzer function can be switched off with this key. Any fat alarm message can be switched off as well, however the internal alarm condition remains active and the alarm restarts at each unit start.



### **Key 3: selection of temperature setpoint**

With this key the temperature setpoint relevant for the regulation is selected. If previously the timer display is active the controller at first switches to temperature display with the first key pressing. With parameters you can determine if the respective setpoint is still selected after switching of the mains voltage or if one of the setpoints S1-S3 is selected.



### **Key 4: selection of timer setpoint**

With this key the timer setpoint is selected and the LED of the timer lights up. The value shows up in the display for 5 seconds and can be adjusted with the UP and DOWN key. If none of the key is pressed the display automatically shows the temperature again, the timer LED goes out. If the key is pressed for 2 seconds the timer is started and the LED flashes. The remaining time is shown only for a moment but the flashing LED indicates the elapsing timer. A permanent display of the remaining time can be activated with parameters, then the LED of the timer is permanently on. If the key is pressed for 5 seconds the timer is stopped and the display indicated "0:00".

### **Key 3+4: setpoint reduction**

Simultaneously pressing these two keys activates the setpoint reduction, in addition with the UP and DOWN key it can be adjusted. Please note that the setpoint reduction is only effective in case of a closed switching input. In case of an activated setpoint reduction a point flashes on the right side of the display. Setpoint reduction is only possible with controllers with switching input(s).



### **Key 5: MELT/TURBO**

With this toggle key one can choose between reduced and accelerated heating mode. Together with the thermostatic function the turbo-heating offers a further increase of heat supply. After switching on the controller the turbo-heating always is deactivated. The key is ineffective if the reduced heating mode is deactivated or in some temperature ranges if no PID characteristic is selected. See below for all choice options.



### **Key 6: ON/OFF**

If this key is pressed for 1 second the controller switches to standby mode, the display shows "OFF" or "AUS" and a started timer cycle is aborted. After switching mains on the controller always is in standby mode. The key can be deactivated, then the controller is switched on with mains voltage.

## **Key 5+6: Reset operating time recording**

By a simultaneous pressing of these keys a reset of the time recording is caused, the display indicates "rES". After releasing the keys the alarm message "OIL" is deleted and if necessary the regulation blocking is cancelled. The accumulated operating time is deleted.

Note that a reset is only possible in case of an alarm message or blocking and below the adjusted temperature limit value. This is to prevent the user from operating the deep-fryers without replacing the fat. However an unconditional reset can be enabled by means of parameters.

### Switching mode of the key MELT/TURBO

#### Status display with LED TURBO

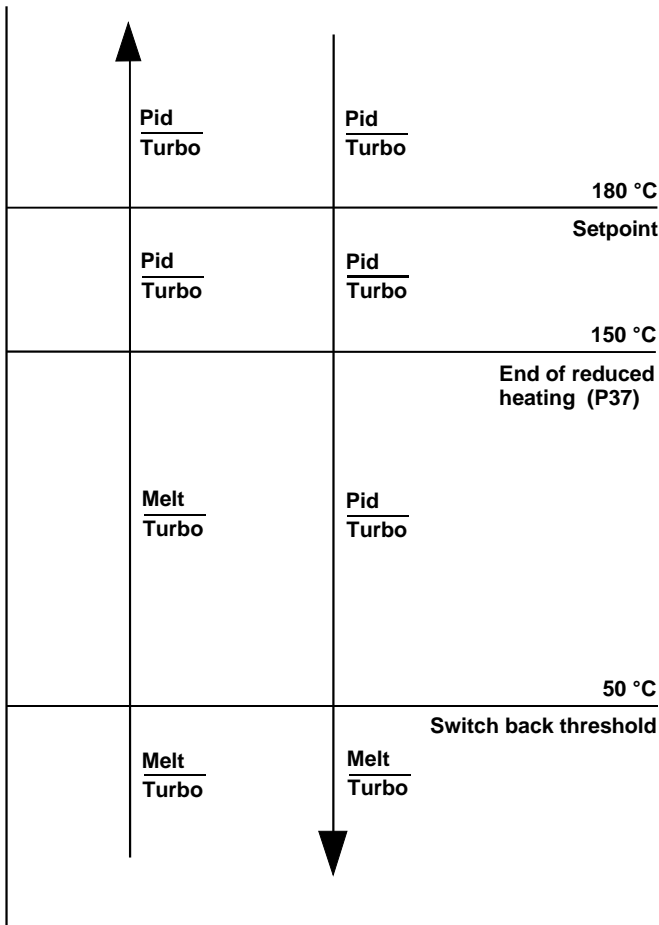
flashing = Melt-function

off = PID-control

on = Turbo-control

#### 1. A6 = 1, A88 = 1

Melt-function and PID-control are activated. The toggle mode of the key depends on the temperature range and if the limit P37 once has been reached. The switching options are shown in the graph below:



#### 2. A6 = 0, A88 = 1

The melt-function is activated and the PID control deactivated. The controller always operates in thermostatic mode (i.e. turbo-heating) after the heating phase. In each case where switching PID/Turbo was possible the key now is ineffective.

#### 3. A6 = 1, A88 = 0

The melt-function is deactivated and the PID control activated. The controller has no reduced heating phase below the limit P37. In each case where switching Melt/Turbo was possible it is now possible to switch between PID/Turbo.

#### 4. A6 = 0, A88 = 0

Both the melt-function and the PID control are deactivated. The controller has no reduced heating phase below the limit P37 and it is set to thermostatic characteristics (i.e. turbo-heating) in all temperature ranges. There are no switching options, the key is ineffective.

### First control level:

#### **Adjustment of the main setpoints and the setpoint reduction**

The main setpoint is indicated by pressing the UP together with the DOWN key, after a short release time it can be adjusted with these keys.

The setpoint reduction is indicated by pressing keys 3+4 together. By additionally pressing the UP or DOWN key it can be adjusted.

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>S1, S2, S3</b>	Temperature setpoints (the currently selected setpoint is indicated and/or adjusted)	P4...P5 °C	170 °C 160 °C 100 °C	
<b>T1,</b>	Timer setpoint	0:00 ... 99:99 Min.	1:11 Min.	
<b>S1'</b>	Setpoint reduction (is added to the main setpoint in case of closed switching input E2)	-99...99.0 K	-5.0 K	

### Second control level (P-parameters):

#### Adjustment of control parameters

The one-finger-setup of the setpoint adjustment requires an exactly simultaneous pressing of the UP and DOWN key for at least 4 seconds to open a parameter list containing control parameters. (If by mistake the setpoint adjustment is released a new attempt is possible after 5 seconds.)

With the UP and DOWN keys the list can be scrolled in both directions.

Pressing key 3 will give you the value of the respective parameter. Pressing also the UP or DOWN key at the same time the value can be adjusted.

Return to the initial position takes place automatically if no key is pressed for 60 seconds.

Parameter	Function description	Adjustment range	Standard setting	Custom setting
P1	Setpoint 2 or DeltaW	-99.9...999°C -99.9...99.9 K	0.0 °C	
P2	Hysteresis contact K1	1...99 K	1.0 K	
P3	Hysteresis contact K2	1...99 K	1.0 K	
P4	Control range limitation – minimum setpoint	-99.9...P5°C	0.0°C	
P5	Control range limitation – maximum setpoint	P4...999.9°C	205 °C	
P7	Proportional band	1...100 K	10.0 K	
P8	Reset time Tn (I-factor)	0...999 sec. (0 sec. = inactive)	0 sec.	
P9	Lead time Tv (D-factor)	0...999 sec. (0 sec. = inactive)	0 sec.	
P10*	Cycle time Tp	2...100 sec.	10 sec.	
P19	Key-lock (only for setpoint setting)	0: no key-lock 1: key-lock	0	
P20	Indication of actual value sensor F1	-----	-----	
P21	Actual value correction sensor F1	-20...20.0 K	0.0 K	
P24	Switch off delay Control contact 1	0.0...99.0 sec.	0.0 sec.	
P25	Temperature limit for fat operating time	0.0...999 °C	999 °C	
P26	Fat operating time until fat alarm message	0...99 h (0 h = inactive)	0 h	
P27	Fat operating time until regulation blocking	0...99 h (0 Std. = inactive)	0 h	
P28	Indication of fat operating time	-----	-----	
P29	Temperature limit for reset of fat operating times	-99...999 °C	100 °C	
P30	Lower alarm value	-99,9°C/K...P31	-40 °C	
P31	Upper alarm value	P30...999 °C/K	208 °C	
P32	Hysteresis alarm circuit	0,1...99.9 K	1.0 K	
P35	“Reduced heating” – heating on	1...255 sec.	60 sec.	
P36	“Reduced heating” – heating off	1...255 sec.	90 sec.	
P37	End of “reduced heating” below setpoint	-99...0.0 K	-30 K	

\* The PID-control suppressed switch-on times below 0.1 seconds.



### Parameter description:

#### P1: Setpoint / DeltaW for control circuit 2

Adjusting the setpoint of control circuit 2.

If A5=1, the setpoints for control circuit 1 and 2 are linked with one another via switching difference DeltaW, which can be adjusted with P1. (operation with DeltaW)

The following applies: setpoint thermostat 2 = setpoint control circuit 1 + delta W2.

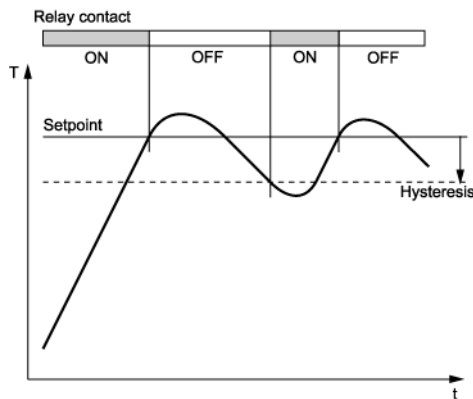
This difference can take positive or negative values. Thus, a leading or following contact can be realised.

#### P2: Hysteresis contact K1

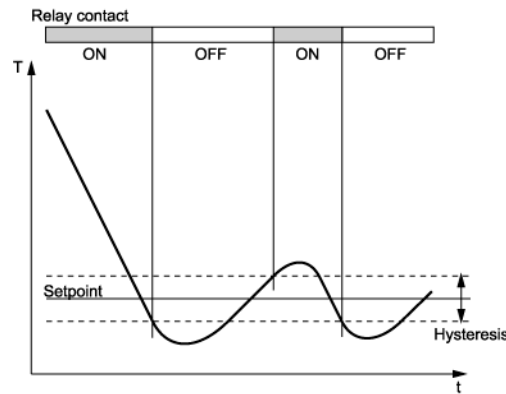
#### P3: Hysteresis contact K2

The hysteresis can be set symmetrically or one-sided at the setpoint (see A40, A41).

At one-sided setting, the hysteresis works downward with heating contact and upward with cooling contact. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point (see fig. 1 and 2).



**Fig. 1:** Heating controller, one-sided hysteresis hysteresis



**Fig. 2:** Cooling controller, symmetrical hysteresis

The hysteresis is only effective if thermostatic mode is enabled, in case of PID characteristic it is ineffective.

#### P4: Control range limitation – minimum setpoint

#### P5: Control range limitation – maximum setpoint

The adjustment range of the setpoint can be limited in both directions. This is to prevent the end user of a unit from setting inadmissible or dangerous setpoints.

#### P7: Proportional band at PID regulation

The proportional part works in such a way that with approximation of the actual value to the setpoint the variable is reduced linearly from +-100% to 0%.

#### P8: Reset time Tn (Integral-portion)

The proportional controller as such has a remaining deviation of the actual value from the setpoint. The integral portion provides for a complete compensation of this offset

The reset time is a measure for the period of time needed to adjust a remaining temperature deviation of the size of the proportional range.

If a small reset time is set, a fast post-adjustment will take place. At a too small reset time, however, the system may tend to vibrate

## **P9: Lead time Tv (Differential-portion)**

The differential portion dampens temperature changes. If a long lead time Tv is set, damping is strong. At too long lead time, however, the system may tend to vibrate. At setting 0 the values are ineffective. It is therefore possible to realise a pure PI or PD regulation.

## **P10: Cycle time Tp**

The cycle time is the time, in which the control output runs through one switching period, i.e. once switched out and once switched on. The smaller the cycle time, the faster the regulation. By consequence, however, there is also an increased switching frequency of the exit, which can lead to rapid wear of relay contacts. For very fast control ways with the respective high switching frequency a voltage output is therefore of advantage.

## **P19: Key-lock**

The key-lock allows blocking of the control keys. In locked condition parameter adjustments with keys is not possible. At the attempt to adjust the parameters despite key-lock the message "===" appears in the display.

## **P20: Actual value sensor F1**

The here indicated temperature presents the sum of actual measured value of sensor F1 and the actual value correction according to parameter P21.

## **P21: Actual value correction**

This parameter allows the correction of actual value deviations caused for example by sensor tolerances or extremely long sensor lines. The regulation measure value is increased or decreased by the here adjusted value.

## **P25: Temperature limit for fat operating time**

Above this temperature the internal recording of fat operating time is started. If the values of P26 and P27 are exceeded the alarm message and/or regulation blocking is activated.

## **P26: Fat operating time until fat alarm message**

After this time period an alarm message requests the exchange of the deep-frying fat. The display indicates flashing "OIL". With P26=0 this function is deactivated and no alarm message occurs. Regulation blocking is still possible. The alarm message appears each time the operating time limit is reached and with every "mains-on" or "standby-on", it can be cancelled with the DOWN key. A reset after an alarm message and cooled down deep-fryer is possible as well. Then the fat is to be changed as the accumulated operating time is deleted.

## **P27: Fat operating time until regulation blocking**

After this time period an regulation blocking requests the exchange of the deep-frying fat. A reset with cooled down deep-fryer has to be carried out to release the blocking and delete the operating time. With P27=0 this function is deactivated and no blocking occurs. Fat alarm message is still possible. With P26=0 and P27=0 no operating time recording takes place.

## **P28: Indication of fat operating time**

The operating hours counter determines the actual operating time of the fat. The time counter runs if the fat temperature is above the value of P25 (only full hours are counted). By pressing the SET key the actual operating time is indicated. The operating time counter can be set to Zero by a reset (pressing the MELT/TURBO key together with the START/STOP key for 10 seconds).

### P29: Temperature limit for reset of fat operating times

To allow a reset of alarm message, regulation blocking and accumulated operating time the fat must be cooled down. This parameter determines the temperature value the fat must be cooled down to this value. This is to prevent the user from operating the deep-fryer without replacing the fat. If a reset after warning message or blocking must be possible independently of the actual temperature P29 must be set to 999°C. With A85=1 the reset can be permitted unconditionally.

### P30: Lower alarm value

### P31: Upper alarm value

The exit alarm is a boundary alarm or a range alarm with one-sided or symmetrical hysteresis (see parameter P32 and A42). Both at the boundary alarm and the range alarm, limit values can be relative, i.e. going along with the setpoint, or absolute, i.e. independent of the setpoint. The operation mode is set with parameter A30. If, in case of boundary alarm and only one switching point is required the not used second switching point should be adjusted to a value above or below the operating range of the controller.

Boundary alarm function (see fig. 5):

The alarm contact is closed if the process temperature is above the upper or below the lower boundary value.

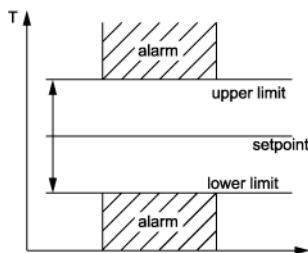


Fig. 5: Boundary alarm, rel. boundaries

Range alarm function (see fig. 6):

Opposite switching behaviour to the boundary value alarm. The alarm contact is closed if the actual value remains between the boundary values.

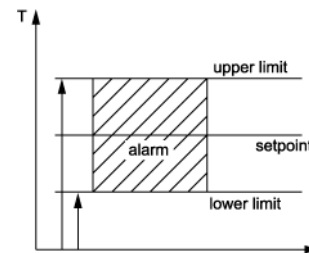


Fig 6: Range alarm, abs. boundaries

### P32: Hysteresis alarm contact

The hysteresis can be set symmetrically or one-sided at the adjusted limit values. (see A42). It becomes effective depending on alarm definition. At one-sided setting and boundary alarm the hysteresis is effective above the lower and below the upper limit value. At one-sided setting and range alarm the hysteresis is effective above the upper and below the lower limit value. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point.

### P35: "Reduced heating" – heating on

This parameter determines the period of the "reduced heating" process where heating is enabled. The sequential switching of the output relay serves for a careful heating if the fat is not yet melted.

### P36: "Reduced heating" – heating off

This parameter determines the period of the "reduced heating" process where heating is disabled.

### P37: End of "reduced heating" below setpoint

This parameter provides a premature cancel of the "reduced heating" process below the setpoint (process ends at [setpoint+P37]°C).

If the sequential heating is supposed to continue until the setpoint parameter P37 is to be set to 0,0K.

### Third control level, (A parameters):

#### Setting of control parameters

Access to the third control level is granted when selecting the last P-parameter on the second control level. Continue to press the UP key for approximately 10 seconds until "PA" appears. Continue to press the UP key and additionally press the DOWN key for about 4 seconds and the first A-parameter of the third control level is indicated.

With the keys UP and DOWN you can scroll the list in both directions. Pressing key 3 will give you the value of the respective parameter. By pressing the UP or DOWN key at the same time the value can be adjusted.

Return to the initial position takes place automatically, if no key is pressed for 60 seconds, or by simultaneously pressing the UP and DOWN key for approx. 4 seconds.

Parameter	Function description	Adjustment range	Standard setting	Custom setting
A1	Switch mode contact K1	0: heating contact 1: cooling contact	0	
A2	Switch mode contact K2	0: heating contact 1: cooling contact	0	
A3	Function of contact K1 at sensor error	0: relay off 1: relay on	0	
A4	Function of contact K2 at sensor error	0: relay off 1: relay on	0	
A5	Selection setpoint 2 or DeltaW	0: operation with setpoint 2 1: operation with DeltaW	0	
A6	Control characteristics contact K1	0: thermostatic 1: PID	0	
A8	Display mode	0: integrals 1: resolution 0.5 K 2: resolution 0.1 K	0	
A9	Remaining time display	0: no remaining time indicated 1: remaining time is indicated	0	
A10	Selection extended frying time	0: fixed time 1...20: flexible time	0	
A11	Buzzer in case of alarm message "OIL"	0: no buzzer 1: buzzer	0	
A12	Buzzer duration after timer ends	1...60 sec.	3 sec.	
A19	Parameter lock	0: no lock 1: A-parameter locked 2: A- and P-parameter locked	0	
A30	Function alarm exit	0: Boundary alarm, relative 1: Boundary alarm, absolute 2: Range alarm, relative 3: Range alarm, absolute 4: Boundary alarm, relative inverted alarm contact 5: Boundary alarm, absolute inverted alarm contact 6: Range alarm, relative inverted alarm contact 7: Range alarm, absolute inverted alarm contact	1	

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>A31</b>	Special function at boundary alarm	0: no special function 1: flashing display 2: buzzer 3: flashing display and buzzer 4: like 3, buzzer can be cancelled	4	
<b>A32</b>	Setpoint display	0: display shows actual value 1: display shows setpoint S1 (S1')	0	
<b>A33</b>	Switching input E1 (if available)	0: not active 1: timer start possible	0	
<b>A34</b>	Switching input E2 (if available)	0: not active 1: setpoint reduction possible (S1' relative to S1)	0	
<b>A40</b>	Hysteresis mode contact K1	0: symmetrically 1: one-sided	1	
<b>A41</b>	Hysteresis mode contact K2	0: symmetrically 1: one-sided	1	
<b>A51</b>	Minimum action time contact K1 „Off“	0.0...99.0 sec.	0.0 sec.	
<b>A56</b>	Alarm suppression after „mains on“ / „standby-on“	0...60 min.	0 min.	
<b>A60</b>	Sensor type	11: Pt100 2-wire 21: PTC 22: Pt1000 2-wire.	11	
<b>A70</b>	Software filter	1: not active, or else 2...32: average value with 2...32 measuring values	2	
<b>A80</b>	Temperature scale	0: Fahrenheit („AUS“) 1: Celsius („AUS“) 2: Fahrenheit („OFF“) 3: Celsius („OFF“)	3	
<b>A85</b>	Reset mode of fat operation time	0: reset after alarm message or blocking and cool down 1: reset unconditionally	1	
<b>A86</b>	Key delay for standby-key	0...100 (x 0.1 sec.)	10 (=1 sec.)	
<b>A87</b>	Standby-function with key On/Off	0: no function 1: standby function	1	
<b>A88</b>	Reduced heating	0: not active, Turbo heating 1: active	1	
<b>A89</b>	Initial setpoint selection after mains on and/or standby	0: same as before 1: S1 2: S2 3: S3	3	
<b>A90</b>	Output connection relay K1	0: no connection 1: connection to contact K1 2: connection to contact K2 3: connection to alarm contact	1	

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>A91</b>	Output connection relay K2	0: no connection 1: connection to contact K1 2: connection to contact K2 3: connection to alarm contact 4: on if standby-on 5: on if timer runs	2	
<b>Pro</b>	Program version	-----		-----

### Parameter description:

*The following values can change the equipment characteristics and are therefore to be set with utmost care.*

#### **A1: Switch mode contact K1**

#### **A2: Switch mode contact K2**

The switch mode for the relays, i.e. cooling or heating function, can be programmed independently at works. Heating function means that the contact opens as soon as the setpoint is reached, thus power interruption. At cooling function the contact closes, if the actual value is above the required setpoint. (see fig. 1 + 2)

#### **A3: Function of contact K1 at sensor error**

#### **A4: Function of contact K2 at sensor error**

At sensor error the selected relay falls back into the condition pre-set here. If there is a data-loss in parameter memory (display indicates "EP") both contacts K1 and K2 are switched off.

#### **A5: Selection setpoint 2 or DeltaW**

This parameter determines whether the setpoints for thermostat 1 and 2 independently adjustable (A5=0) or whether they are tied with one another via a switching offset DeltaW (A5=1). This parameter applies only to contact K2 (see parameter P1).

#### **A6: Control characteristics contact K1**

Independent choice of either PID or thermostatic characteristics for contact K1.

#### **A8: Display mode**

The value can be indicated in integrals or with decimals. In general, all parameter indications are presented with decimals.

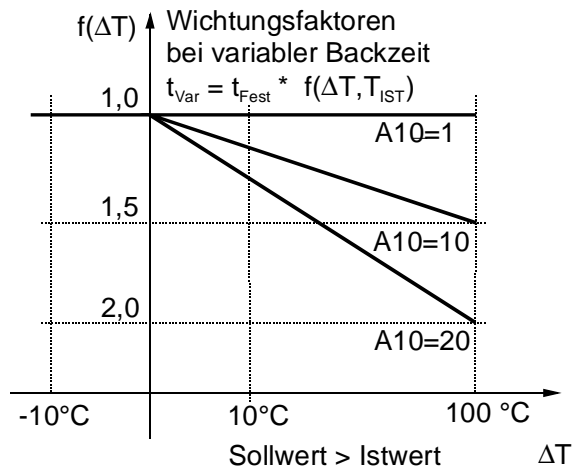
#### **A9: Remaining time display**

This parameter is to show the remaining time of the running timer. With A9=0 the time LED flashes and the remaining time can be indicated for 3 seconds by pressing the START key.

### A10: Selection extended frying time

With A10=0 the frying time corresponds exactly to the programmed time.

With A10=1...20 a weighing factor is specified to compensate a drop of temperature caused by the frying goods. The prolongation of the frying time depends on the deviation of the set point.



Actual value	A10	Effective frying time
180 °C	0	100 sec.
150 °C	0	100 sec.
180 °C	1	100 sec.
150 °C	1	120 sec.
180 °C	10	100 sec.
150 °C	10	135 sec.
180 °C	20	100 sec.
150 °C	20	150 sec.
125 °C	20	210 sec.
100 °C	20	300 sec.

**Table:** Setpoint 180 °C, frying time 100 sec.

### A11: Buzzer in case of "OIL" alarm message

This parameter determines whether the buzzer rings out in case of „OIL“ alarm message.

### A12: Buzzer duration if timer ends

This parameter sets the buzzer duration after timer stop.

### A19: Parameter lock

This parameter enables locking of each parameter level. If third level is locked, only parameter A19 may be changed.

### A30: Function alarm exit

The alarm exit evaluates an upper and a lower limit value (see parameters P30 and P31), whereas a selection is possible as to whether the alarm is active if the temperature lies within these two limits, or whether the alarm is released if the temperature lies beyond them. In the case of sensor error, the alarm is activated independently of this adjustment. The output can be inverted to operate as a release.

### A31: Special function at boundary or alarm

Here can be selected whether, in the case of an alarm, the indication to flash and/or the buzzer is to start. Sensor alarm (display F1L or F1H) is indicated independently thereof by flashing display and the buzzer.

### A32: Setpoint display

A32=0 indicates the actual value, A32=1 statically indicates the setpoint S1 or S1' in the display. Therefore, the current actual value can only be indicated with parameter P0.

### A33: Activation switching input E1 (if available)

This determines the function of switching input E1.

### A34: Activation switching input E2 (if available)

This determines the function of switching input E2.

**A40: Hysteresis mode contact K1****A41: Hysteresis mode contact K2**

These parameters allow selection as to whether the hysteresis values which are adjustable with P2, P3 are set symmetrically or one-sided at the respective switching point. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point. The one-sided hysteresis works downward with heating contact and upward with cooling contact (see fig. 1 + 2).

**A51: Minimum action time K1 "off"**

These parameters permit a delay in switching on the relay in order to reduce the switching frequency. The adjusted time sets the entire minimum time period for a switching-off phase.

**A56: Alarm suppression after "mains-On" and/or "Standby-On"**

This parameter allows a switching-on delay of the alarm contact after switching on the mains voltage or standby. This delay corresponds with the time set here.

**A60: Sensor type**

This parameter permits selection of the sensor type, if the needed hardware prerequisites are available.

**A70: Software filter**

With several measuring values, it is possible to obtain an average value. This parameter can determine by how many measured values an average value is to be formed. If a sensor with a very fast reaction to external influences is used, an average value ensures a calm signal course.

**A80: Temperature scale**

Indication can be switched between Fahrenheit and Celsius. At conversion, the parameters and setpoints maintain their numerical value and adjustment range. (Example: A controller with the desired value of 0°C is switched to Fahrenheit. The new desired value is then interpreted as 0°F, which corresponds to a temperature of -18°C).

NOTE: Indication limits with °F can be smaller than the actual measuring range!

**A85: Reset mode of fat operation time**

To force the exchange of used fat, a reset of the fat operation time is only possible in case of an alarm message or regulation blocking together with the cool-off according to parameter P29. If the fat exchange is secured otherwise an unconditional reset can be enabled with this parameter.

**A86: Key delay for Standby key**

This parameter is to activate a delay time for the On/Off key. Please note the 0.1 seconds scale.

**A87: Standby function with Start/Stop key**

The standby function can be disabled.

**A88: Reduced heating**

With this parameter the "reduced heating" mode can be enabled.

**A89: Initial setpoint selection after mains on and/or standby**



### A90: Output connection relay K1

### A91: Output connection relay K2

Generally, the outputs are exchangeable with parameter adjustments, in order to achieve an optimal relation of the existing hardware with regard to contact rating, kind of contact and number of cycles. Therefore, these parameters first assign the outputs to the controller function.

### Pro: Program version

Indication of the program version.

### Status messages

Message	Cause	Error elimination
<b>F1</b>	Sensor error (Short or open circuit at sensor F1, the buzzer sounds)	Check sensor
<b>EP</b>	Data loss at parameter memory	If error can not be eliminated by resetting the unit the controller must be repaired.
<b>“OIL” flashing, regulation runs</b>	Alarm message, caused by fat operation time exceeding (see P26)	Delete with DWON key
<b>“OIL” flashing, regulation blocked</b>	Regulation blocking, caused by fat operation time exceeding (see P27)	Delete with MELT + ON/OFF key
<b>“rES”</b>	Confirmation of the reset of the fat operating time	
<b>"----"</b>	Key lock (see P19 and/or A19)	-----
<b>Flashing display</b>	Boundary or range alarm (if activated, triggered by temperature monitoring at sensor F1)	-----
<b>Flashing point on the right</b>	Setpoint reduction activated (only with units with switching input))	-----
<b>Buzzer</b>	Temperature alarm (see A31)	The buzzer can be stopped with the DOWN key.

Error messages are saved and indicated even if the cause is eliminated. Pressing the DOWN key deletes the error message.

## Technical data of ST501-QE1TA.09

### Digital inputs (if available)

- E1:** external potential-free switching contact for timer start  
The input is intended for a pushbutton. Pressing the button starts the timer. Pressing it again – even if the timer not yet has elapsed – the timer restarts with the selected time.
- E2:** external potential-free switching contact for setpoint reduction  
The closed switching input enables the setpoint reduction. A flashing point in the right of the display indicates this condition. Each change causes an initialisation of the control.

### Measuring input

- F1:** Resistance thermometer PTC/Pt100
- |                  |  |                |
|------------------|--|----------------|
| Measuring range: | PTC (KTY81-121)  | -50°C...+130°C |
|                  | Pt100  | -80°C...+400°C |
| Accuracy:        | ±0.5K ± 0.5 % at 25°C, without sensor                  |                |
|                  | ±1K ± 0.5 % of scale range (0...+55°C), without sensor |                |

### Outputs

- K1:** Relay 10(1.5)A 250V~, change-over contact
- K2:** Relay 8(1.5)A 250V~, change-over contact
- Summer ca. 85dB

### Display

One 4-digit LED-Display, height 13 mm, colour red  
6 LEDs for status display

### Power supply

230 V 50/60 Hz, power consumption max. 6 VA

### Connectors

12-pole screw terminal, spacing 5.0 mm, for cable up to 2.5 mm<sup>2</sup>

### Ambient conditions:

Storage temperature: -20...+70°C  
Operating temperature: 0...+55°C  
Relative humidity: max. 75% without dew

### Weight

ca. 350 g, without sensor

### Enclosure

Front IP65, IP00 on the back

### Installation data

The unit is to be installed in an instrument panel.

Front size: 106 x 68 mm  
Panel cut-out: 87.5 x 56.5 mm  
Installation depth: ca. 60mm