

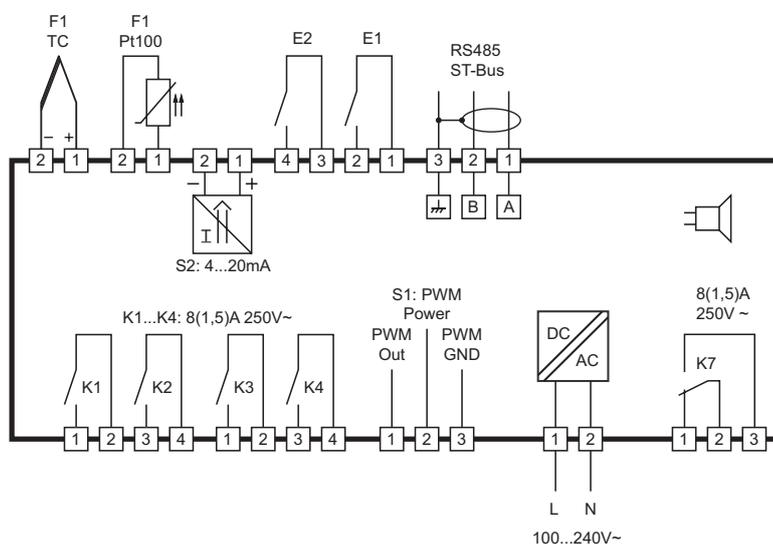
## Deep-frying controller

**Order number: 900350.053**

As of: 07.03.2022 V2.73



## Wiring diagram



## Product description

The ST552G fryer controller consists of a mineral glass-based touch panel that can be easily integrated into existing or newly constructed installations. The controller can be supplied with a voltage of 100...240V AC and has two displays, five switching outputs and two digital switching inputs. A temperature sensor type Pt100 or a thermocouple can be connected. Five LEDs each indicate the selected temperature setpoint and the selected time setpoint. The controller is networked by means of an ST-Bus interface.

<b>Sensor:</b>	Thermo couple, Pt100
<b>Range:</b>	dependant on type of sensor
<b>Front size:</b>	154,8mm x 61,8mm
<b>Installation size:</b>	180 x 87mm
<b>Tightness:</b>	Front IP65
<b>Connectors:</b>	Screw terminal

**Design**

The unit is designed as a complete installation unit and is intended for rear mounting. The innovative capacitance keypad allows a smooth glass front and makes the unit particularly suitable for applications with a high degree of contamination. All inputs and outputs are connected at the rear. The unit fulfils the function of a temperature controller with timer functions and is designed for use with deep-fat fryers.

**Function**

The front of the unit has a three- and four-digit display, eight control buttons and twelve LEDs. Five LEDs indicate the selected temperature setpoint ("TEMPERATURE 1, 2, 3, 4, 5"), five LEDs indicate the selected timer ("TIME 1, 2, 3, 4, 5") and one LED indicates the current status of the control output ("HEAT"). The LED on the Melt/Turbo key indicates the operating status selected there. If it is on, gentle heating is in progress. The reverse display direction can be set via parameter P17.

A temperature sensor type Pt100 or a thermocouple type J is connected for recording the actual control value. Two switching inputs allow the external start and stop of the timer and the connection of an alarm contact for over-temperature. In case of over-temperature, the display shows "UEB" or "Hot" flashing and the control is switched off. The function of the switching inputs can be deactivated via the parameterisation.

Four NO contacts and one changeover contact are provided as output relays. The function "heating thermostat 1" or "heating PID" can be selected for output K1 via the parameterisation; deactivation is also possible. Output K2 has the basic function "cooling thermostat 2" and can be used for an release function. Output K3 operates the basket lowering after timer start and output K4 the basket raising after timer stop, both of which also apply when a timer is stopped in between. Output K7 is assigned to the limit value alarm.

The controller has the option of "gentle heating" in case the fryer fat is still solidified. This slowed-down heating process (Melt function) is active after mains on and ends when a limit value is reached that can be set below the setpoint. If the fat has visibly melted, the Melt/Turbo key can be used to switch to accelerated heating even before the limit value is reached. When cooling down, the turbo characteristic is initially maintained; only below 50 °C, the reloading of unmelted fat is assumed and the controller automatically switches back to gentle heating.

You can also enter a variable frying time. Taking a parameterisable weighing factor into account, the time of the started timer is increased or reduced dynamically, depending on the control deviation.

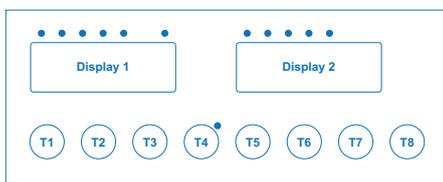
A pair of limit values that can be set in the parameterisation allows a temperature alarm related to the actual control value, whereby relative and absolute limit values can be

selected. In these alarm cases, the control continues to run. An internal buzzer allows an acknowledgeable warning signal.

**Parameterisation**

Parameterisation mode can be activated by pressing the Temperature Up and Temperature Down buttons simultaneously for 3 seconds. Parameter P1 appears in the display. Use the Up and Down buttons to scroll through the parameters. To access higher parameters quickly, scroll backwards using the Down button. Press the Melt-Turbo button to activate the value of the current parameter, the digit which can be changed will be flashing. Use the temperature selection button to select other digits. Once, you return to P1,... the changed value is saved. Now, you can return to normal mode by pressing Up+Down. After 60 seconds, the controller returns to normal mode automatically without saving any changes.

**Displays**



**Display 1** (left): Temperature  
**LEDs 1...5** (left): Temperature selection

**Display 2** (right): Timer  
**LEDs 1...5** (right): Timer selection

**Top centre LED:** Status heating output  
**Button LED:** Gentle heating (Melt)

**Function of the control buttons**

**General notes**

With the present capacity keyboard, undesired reactions of the controller are possible, for technical reasons, when steam vapours occur without the operator having pressed a key. For these applications, a special delaying selection and setting mimic can be selected (P47=1), in which an additional key press is forced at the beginning of each setting procedure. If this is not needed in practice, it is possible to switch to the faster selection and setting (P47=0, no delay).

**Key 1: UP - Temperature**  
Use this button to increase a temperature value activated via the temperature selection. A delayed one-finger setup is implemented. After tapping the button the display gets dark for a short period (parameter P49) for unlocking. Once the display comes back, the value is increased

without any further delay by tipping or keeping the button pressed to increase the increment and reach distant end values faster. The maximal increment can be parameterised.

For non-delayed key operation the timer side has the same behaviour, if the actual value is selected as the permanent display (P32 = 0). only the short darkening of the display doesn't take place.

Single-finger setup is implemented on the parameter level, too. Here, the UP button is used for switching to the following parameter and for adjustment, after the value was activated with the Melt/Turbo button and the digit to be adjusted was selected via the selection button. You can scroll through the digits.

**Key 2: DOWN - Temperature**  
Use this button to reduce a temperature value activated via the temperature selection. The procedure corresponds to increasing the value via the UP button. The same applies to the parameter level.

The down button is also used for acknowledgement of the buzzer. Since the timer remains active when parameterisation mode is activated, the buzzer can also be acknowledged there.



### Key 3: Temperature selection

Use this button to select the setpoint to be used by the controller. Scroll to select, each push of the button switches the display further one step. The selected temperature setpoint remains active even after disconnection of mains supply. Special presets are also possible.

In “delayed key operation” the selection lamp goes off when initially pressed briefly, then the button must be released and from then on you can change instantaneously. In non-delayed key operation the change takes place immediately



### Key 4: MELT/TURBO

Use this button to toggle between gentle heating and fast heating when the controller is switched on. This is only possible below an adjustable threshold below the limit value (P73). “MELT” mode is always activated when the device is turned on. A key delay can be set with parameter P48.

The status LED is on during “gentle heating” mode (MELT function). It is possible to select the reverse behaviour with parameter P17, i.e. the LED is on during fast heating (TURBO function).

With the “Superturbo” function, which can be triggered with this key above the limit value from P73, thermostatic control takes place until a switch-off value (P15) set at the setpoint is reached. In this zone, the key toggles between thermostatic and PID char-

acteristics. The “Superturbo” option must be enabled with P15. The status lamp always indicates the active “Superturbo” by flashing.



### Key 5: UP - Timer

Use this button to increase a time value activated via the time selection. One-finger setup is implemented. Keep the button pressed, after a short unlocking delay, the value is increased without delay. Now, you can also release the button and press it repeatedly briefly. In this case, the increment increases so that you can set higher end values more quickly. Changing the time is possible while the timer is running down. The new value will be saved and used immediately for the active timer operation.

The procedure in relation to the selected key operation mode (parameter P47) corresponds to the temperature side. In non-delayed key operation mode however, there is no additional keypress on this side.



### Key 6: DOWN - Timer

Use this button to decrease a time value activated via the temperature selection. The procedure corresponds to increasing the value via the UP button.



### Key 7: Timer selection

Use this button to select the time to be used by the timer. Scroll to select, each push of the button switches the display further one step. The selected time value remains active even after disconnection of mains supply.

Special presets are also possible.

The procedure in relation to the selected key operation mode (parameter P47) corresponds to the temperature side.



### Key 8: START/STOP

As soon as this button is pressed and released again, the selected timer is started. The remaining time appears in the display. The timer can be stopped at any time. When the timer has elapsed, the acoustic signal will be active for 3 seconds. It can be acknowledged by pressing the DOWN button. The timers have no influence on the control operation. If you press the button for at least 2 seconds, the timer will be stopped again.

In addition, you can turn the controller to standby by pressing the button for at least 5 seconds. In the right display, OFF will appear. Press the button again, to turn the controller on again. Via the parameterisation, you can also set up a button delay for the restart (P43). In addition, you can change the message displayed to OFF (parameter P36). Via the parameterisation, you can also deactivate the standby function completely (parameter P41). In this case, the controller will always be on after Mains ON



### Key 4+8: Reset of fat time registration

Pressing these buttons simultaneously for at least 3 seconds will reset the time registration. The warning message F1 is withdrawn and, if necessary, the control blocking is also cancelled. The accumulated operating time is deleted. The display briefly shows rES. Note that the reset is only possible if a warning status has occurred or if blocking has occurred, and also only below an adjustable temperature limit. This is to prevent the user from continuing to operate the fryer without changing the fat. However, the reset can also be enabled unconditionally.

## Setpoint level

Parameter	Description of function	Setting range	Default value	
<b>Temperature setpoints</b>				
S1	Temperature setpoint 1:	P4 ... P5	110 °C	
S2	Temperature setpoint 2:	P4 ... P5	120 °C	
S3	Temperature setpoint 3:	P4 ... P5	130 °C	
S4	Temperature setpoint 4:	P4 ... P5	140 °C	
S5	Temperature setpoint 5:	P4 ... P5	150 °C	
<b>Timer setpoints</b>				
T1	Time 1:	0:00 ... 59:59 Min.	1:11 Min.	
T2	Time 2:	0:00 ... 59:59 Min.	2:12 Min.	
T3	Time 3:	0:00 ... 59:59 Min.	3:13 Min.	
T4	Time 4:	0:00 ... 59:59 Min.	4:14 Min.	
T5	Time 5:	0:00 ... 59:59 Min.	5:15 Min.	

Parameter	Description of function	Setting range	Default value	Cust. value
<b>General control parameters</b>				
P1	Delta W control circuit 2	-99...+99.0 K	10.0 K	
P2	Hysteresis control circuit 1	0.1...99.0 K	1.0 K	
P3	Hysteresis control circuit 2	0.1...99.0 K	1.0 K	
P4	Bottom setpoint limitation	0...999 °C	0 °C	
P5	Top setpoint limitation	0...999 °C	999 °C	
P6	Correction actual value 1	-20.0...+20.0 K	0.0 K	
P7	Display actual value 1	-	-	
P8	Initial temperature selection after Mains On	0: Selection as before 1...5: Selection of setpoint 1...5	0	
P9	Initial time selection after Mains On	0: Selection as before 1...5: Selection of time value 1...5	0	
<b>PID parameter</b>				
P11	Control circuit 1: Proportional range in PID control	0.1...999 K	20.0 K	
P12	Control circuit 1: Integral time in PID control (I portion)	0...999 sec. (0 sec. = inactive)	500 sec.	
P13	Circuit. 1: Derivative action time in PID control (D portion)	0...999 sec. (0 sec. = inactive)	50 sec.	
P14	Control circuit 1: Cycle time in PID control	2...100 sec.	10 sec.	
P15	„Superturbo end“ around the setpoint	-50...+50.0 K	15.0 K	
P16	Switching mode of the Melt/Turbo key	0: Normal operation 1: Switch to „Superturbo“	1	
P17	Behaviour of the MELT/TURBO LED	0: on during MELT 1: on during TURBO	0	
<b>Relay delay</b>				
P18	Switch-off delay for heating relay	0.0...99.0 sec.	0.0 sec.	
<b>Key lock</b>				
P19	Key lock (Setpoint adjustment disabled)	0: Not locked 1: Locked	0	
<b>Alarm parameters</b>				
P21	Lower alarm limit	-99...999 °C/K	-99 K	
P22	Upper alarm limit	-99...999 °C/K	200 K	
P23	Hysteresis alarm, one side	0.1...99.9 K	1.0 K	
P24	Alarm function	0: Alarm limit relative 1: Alarm limit absolute	1	
P25	Special function in case of alarm	0: Not active 1: Display flashing, buzzer active	0	
P26	Alarm suppression after Mains On	0...60 min.	0	
P27	Buzzer duration when timer elapsed	0...60 sec. (0 sec. = inactive)	5 sec.	
P28	Buzzer type	0: continuous 1: pulsating	0	
P29	Blinking after timer expiry	0...180 sec. (0 sec. = inactive)	0 sec.	
<b>Display parameters</b>				
P31	Display mode basic level	0: Integral numbers 1: Resolution 0.5 K 2: Resolution 0.1 K	2	
P32	Type of temperature display	0: Actual value display 1: Setpoint display	0	
P33	Type of time display	0: Remaining time display 1: Operating time display	0	

Parameter	Description of function	Setting range	Default value	Cust. value
P34	Temperature scale	0: Fahrenheit 1: Celsius	1	
P35	Message in case of overtemperature	0: <b>UEb</b> 1: <b>Hot</b>	0	
P36	Display in case of standby off	0: <b>AUS</b> 1: <b>OFF</b>	0	
P37	Blinking mode during timer (when the timer has elapsed, P29 is effective)	0: during buzzer 1: during buzzer and after timer has elapsed 2: different blinking intervals during/after the timer and during activated buzzer	0	
<b>Key parameters</b>				
P41	Standby function	0: Not active 1: Standby with button click 2: Standby via ST-Bus 3: Standby with button and ST-Bus	1	
P42	Internal buzzer mode	0 ... 15 (0 = buzzer inactive) Bit mask (add values): +1: Button klick +2: Baking end +4: Error, high temperature/sensor error +8: Errors like an alarm relay	15	
P43	Delay of Start/Stop key at Standby-On	0.1...5.0 sec.	1.0 sec.	
P44	Delay before start of Turbo setup	0.0...2.0 sec.	0.5 sec.	
P45	Maximum increment/decrement in turbo setup, temperature setting	1...20 K	5 K	
P46	Maximum increment/decrement in turbo setup, time setting	1...20 sec.	5 sec.	
P47	Key operating mode	0: standard mode (no delay) 1: delayed key operation	1	
P48	Key delay for MELT/TURBO key	0.1 ... 5.0 sec.	0.5 sec.	
P49	Key delay for setup (if P47=1)	0.5 ... 3.0 sec.	1.0 sec.	
<b>Input and output parameters</b>				
P51	Function of external input E1	0: No function 1: External start/stop 2: Access to parameter level	0	
P52	Function of external input E2	0: No function 1: Message overtemperature 2: Feedback in case of "Gas" and "Gas+fan" heating mode	0	
P53	Switching mode input E2	0: Active when open 1: Active when closed	1	
P54	Assignment output K1	0: Not active 1: Thermostat control circuit 1 (not with P56=2 and P56=3) 2: PID control circuit 1	2	
P55	Assignment output K2	0: Not active 1: Thermostat 2 2: on together with controller on	1	
P56	Type of heating	0: Gas heating with feedback 1: Electrical (or gas heating without feedback) 2: Gas+fan, gentle heating realised via fan 3: Gas+fan, gentle heating realised via burner	2	
P57	Type of PWM / analogue signal (fan selection)	0: Active when high (230V~) 1: Active when low (24V=)	0	
P58	Tolerance time for burner start and restart chance	1...20 sec.	10 sec.	
P59	Min. on/off time during burner clocking	1.0...5.0 sec.	5.0 sec.	

Parameter	Description of function	Setting range	Default value	Cust. value
<b>Fan Parameters</b>				
P61	Minimum speed at fan	0...100 % (PWM/analogue signal)	30 %	
P62	Maximum speed at fan	0...100 % (PWM/analogue signal)	100 %	
P63	Maximum speed increase per 0.1 sec.	1...250 stages	4 stages	
P64	Correcting variable in case of clocked operation	0...100 % (PWM / analogue signal)	50 %	
P65	Lead/delay time of fan	1...60 sec.	5 sec.	
P66	Time for start increase	1...60 sec.	5 sec.	
P67	Starting boost (for P61/P62)	0 ... 100% (PWM/analogue signal)	100%	
<b>Fryer parameters</b>				
P71	On time of heating clocking	1...255 sec.	60 sec.	
P72	Off time of heating clocking	1...255 sec.	90 sec.	
P73	Clock end below threshold	-99...0,0 K	-30 K	
P74	Activation of burner clocking	0: Not active 1: Burner clocking below setpoint	1	
P75	Duration of basket lowering at K3 at start of timer	0...30 sec. (0 sec. = inactive)	5 sec.	
P76	Duration of basket raising at K4 at start of timer	0...30 sec. (0 sec. = inactive)	5 sec.	
P77	Selection of post-frying time	0: Fixed time 1...20: Elastic time	0	
P78	Activation of heating clocking	0: Not active, always turbo heating 1: Gentle heating	1	
P79	Threshold for return to heating clocking mode	0.0...99.0 °C	50.0 °C	
<b>Operating time parameters</b>				
P81	Temperature limit for fat operating time elapsed	0.0...999 °C	999 °C	
P82	Fat operating time until warning message	0...99 hrs. (0 hrs. = inactive)	0 hrs.	
P83	Fat operating time until controller block	0...99 hrs. (0 hrs. = inactive)	0 hrs.	
P84	Display of fat operating time	—	—	
P85	Temperature limit for reset of fat operating time (only effective if P85 = 2)	-99...999 °C	100 °C	
P86	Reset option of fat operating time	0: No restrictions 1: After warning message or blocking 2: After warning message or blocking plus cool-down	2	
<b>Sensor and hardware parameters (if changed, Mains Off required)</b>				
P91	Selection of sensor type	0: Pt100 2-wire 1: Thermocouple type J (Fe-CuNi) 2: Thermocouple type K (NiCr-Ni)	0	
P92	Display compensation	—	—	
P93	Software filter depth	1...64	8	
P94	Mains frequency	0: 50 Hz 1: 60 Hz	0	
P95	Type of analogue output	0: 0-10 V 1: 4-20 mA	1	
<b>LowFat and NoContact settings</b>				
H1	Temperature increase for test heating „LowFat“	0.1...99.0 K	1.0 K	
H2	Minimum duration for test heating „LowFat“	0...240 sec. (0 sec. = inactive)	0 sec.	
H3	Maximum duration for test heating „NoContact“	0...240 sec. (0 sec. = inactive)	0 sec.	
H4	Temperature increase for test heating „NoContact“	0.1...99.0 K	1.0 K	
H5	Max. temperature for LowFat- and NoContact settings	1...990 °C	60 °C	

Parameter	Description of function	Setting range	Default value	Cust. value
<b>Timer characteristics</b>				
<b>t ic</b>	Timer function	0: without multiple starts 1: with multiple timer starts	0	
<b>Address + version</b>				
<b>LO</b>	Controller address	1...255	5	
<b>Pro</b>	Program version	—		

**LowFat- and NoContact control setting**

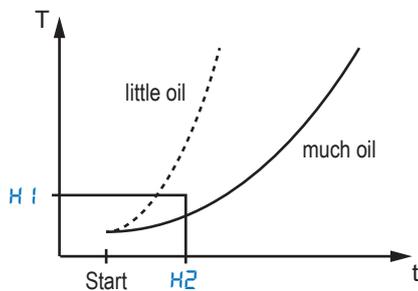
**General**

Temperature monitoring a fryer can show whether enough oil is available. The LowFat and NoContact control settings provided by the controller carry out this task. Low Fat and No Contact operate independently, each have their own parameters and can be de-selected separately.

At the moment of turning on the burner the control settings start running both at once and a test heating starts.

**Heating dynamics at various amounts of oil:**

Rule of thumb: The more oil, the slower the heating rate at a given heat output.



The illustration shows the heating up with small or large quantities in the deep fryer tank

**Fryer design features**

The special features in the design of the deep-fryer must be taken into account. The temperature measurement value depends on the thermal coupling of the sensor to the oil or heating system. If the thermal coupling disappears with little oil, then the temperature also increases slowly or not at all.

The illustrations show different constructions and thermal coupling to the sensor.

**Temperature behaviour of the different designs**

**Example A:**

If there is so little oil present that the sensor is no longer immersed in oil, it measures approximately the air temperature instead of the oil temperature and hardly changes the measured value during heating.

The lack of oil then becomes noticeable as too little temperature rise.

**Example B:**

In design B, a mixing temperature can occur because the sensor has thermal contact with the oil and the tank wall.

The temperature at the sensor rises when the oil heats up, or when heat is transferred to the sensor via the tank wall through heat conduction.

**Example C:**

In design C, the sensor is always in thermal contact with the medium.

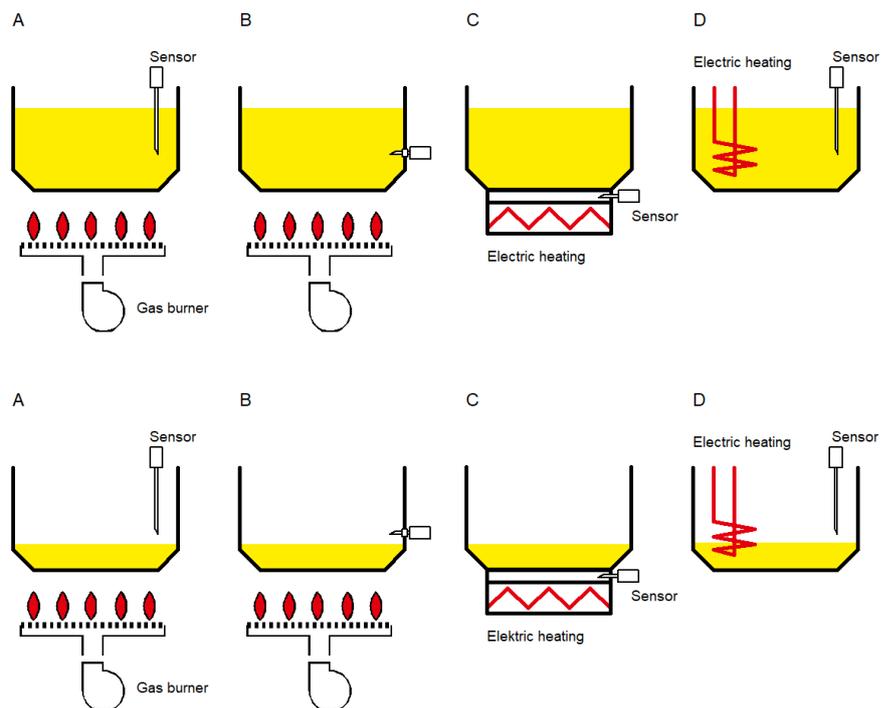
In this case, the lower the amount of oil present, the higher the temperature rise.

**Example D:**

Design D has the same characteristics as design A.

**Parameters involved**

<b>H1</b>	Temperature rise for sample heating "LowFat".
<b>H2</b>	Minimum duration for sample heating "LowFat".
<b>H3</b>	Maximum duration for "NoContact" test heating
<b>H4</b>	Temperature rise for "NoContact" sample heating
<b>H5</b>	Maximum temperature for LowFat and NoContact facial expressions



**Test heating procedure and alarm conditions**

**Once after start**

After switching on the controller, it once executes a test heating. This is to avoid that the fryer is started, if there is no or insufficient oil.

**To fast temperature rise with little oil**

Parameter **H2** defines a minimum required time for the temperature rise according to parameters **H1**.

In case of a faster temperature rise the heating is switched off and an alarm with "lack of oil" message is triggered.

**To slow temperature rise without oil**

Parameter **H4** defines a minimum required temperature rise for the duration according to parameter **H3**.

A slower temperature rise may indicate that no oil is present and the sensor is no longer in the oil. The heating is switched off and an alarm with "lack of oil" message is triggered.

**Please note:**

If a medium other than oil is used and the heat output is changed, other parameter values will result.

**In baking mode**

In baking mode, i. e. above the temperature of parameter **H5**, the process is no longer reliable.

- Monitoring of the minimum temperature increase is not possible when cold goods are thrown into the deep fryer.
- The monitoring of the maximum temperature increase is not possible because this would require an unallowed deviation from the setpoint.

**Temperature range for LowFat- and No-Contact settings**

Parameter **H5** sets a limit, up to which the test heating is started after switching on the controller.

Please note that the test heating is aborted if this limit is exceeded.

**Alarm and Reset**

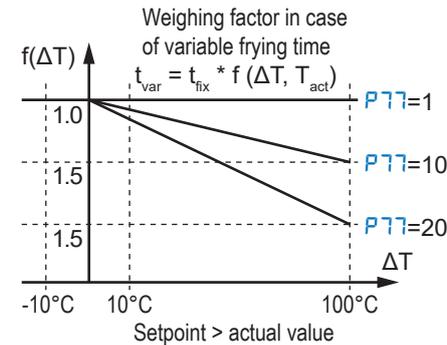
If the test heating causes an alarm, the display flashes with "**FRt**" and the buzzer sounds. The test heating is stopped and the heater (i.e. burner and fan) is switched off.

The buzzer can be acknowledged immediately with the DOWN key. To reset the alarm fill up oil and switch off and back on the controller with the OFF key

**Selection parameter post-frying time**

With parameter **P77**, you can define if the frying time is exactly the programmed time or if the frying time is to be extended if the fried material causes a temperature decrease.

Extension of the frying time, also referred to as elastic time or post-frying time, depends on the deviation from the setpoint. If the setpoint is exceeded, the time is reduced.



Setpoint 180 °C, selected frying time 100 s

Act. value	P77	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.

**Feedback in case of heating modes "Gas" and "Gas+fan"**

In the case of heating modes "Gas" and "Gas + Fan", a feedback signal detected via switching input E2 can be used. The feedback confirms that the burner has started properly. Otherwise, the control is stopped. The feedback signal is considered in different ways in the case of these heating modes.

**Heating mode "Gas"**

Control at the heating output is effected only if the feedback is present on switching input E2. Without the feedback, the heating relay is not switched on. If the feedback is missing during the heating process, the relay is switched off. In this heating mode, no error message is triggered nor is it necessary to acknowledge an error.

**Heating mode "Gas+Fan"**

**Restart with controller switched off:**

Control at the heating input will be activated upon request by the controller part. After that, the system waits for receipt of the feedback (for the time set in parameter **P58**). If the feedback is received at switching input E2 of if it is already present at the time of the request, the control operation is continued. If not, the control operation is switched off. The "HEAT" lamp flashes slowly signalling the start error. To acknowledge and restart the control operation, press the "OFF" button, i.e. switch to Standby Off and on again. Burner failure with restart chance:

If the feedback fails during the control operation, the fan is switched back to minimum speed according to parameter **P61** immediately. The system waits for the restart of the burner and the return of the feedback signal (for the time set in parameter **P58**). The "HEAT" lamp flashes quickly signalling the restart chance. If the feedback signal is received again, the control operation is continued. If the feedback is not received within this time, the control operation is switched off. The "HEAT" lamp flashes slowly signalling the burner failure. To acknowledge and restart the control operation, press the "OFF" button, i.e. switch to Standby Off and on again.

**Deactivation of feedback**

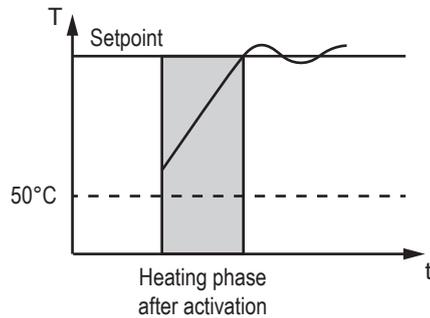
Via parameter **P53**, you can deactivate the feedback function by reversing the switching mode of switching input E2. In this case, the controller will interpret the open switching input, to which nothing may be connected, as a feedback signal. Independent of this, the feedback will also be deactivated if you assign other functions to the switching input via **P52**.

The control function of the deep fryer controller is explained in the following and will always be valid while the controller is switched on.

**Control function**

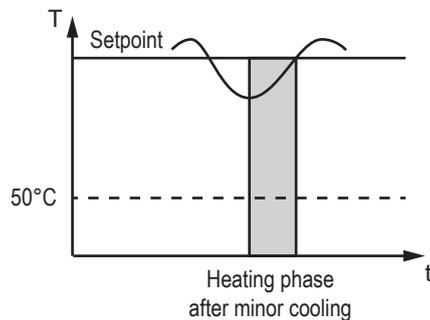
**Heating phase without manual intervention:**

Heating phase after activation:



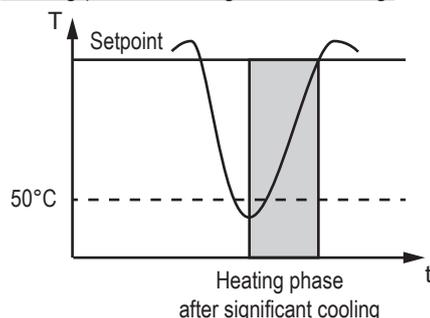
After activation and start of the controller, a slow heating phase will always follow when the fat is cold. This phase ends at latest when the setpoint is reached. In this slow heating phase, the heating relay clocks, i.e. with the on time set in parameter **P71** being followed by the off time set in parameter **P72**. Slow heating is to ensure that congealed fat is heated up gently at the start of operation. Via parameter **P73**, you can stop the slow heating phase before the setpoint is reached. If this is not desired, set **P73**=0.0 K.

Heating phase after slight cooling:



After a minor cooling down to temperatures above 50 °C, e.g. by loading small amounts of cold fat, the normal heating function of the controller is maintained. The reheating phase is therefore not slowed down; if the thermostat function is set via the parameterisation, the heating relay does not cycle. If the PID function is preset, the heating relay only cycles within this range. The end of the cycle set with **P73** has no effect.

Heating phase after significant cooling:



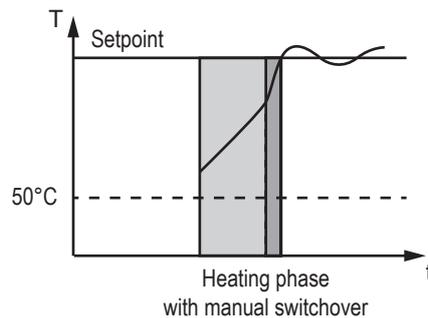
After significant cooling to temperatures below 50 °C, e.g. loading of large quantities of cold fat, the slow heating function is activated again. The heating relay cycles again like in the initial heating phase, until the setpoint or the cycle end below the setpoint defined in parameter **P73** is reached again. This is to ensure gentle heating of the reloaded fat.

Control after heating

After the heating phase, the controller works with the PID function based on parameter group **P11** to **P14**.

**Heating phase with manual intervention:**

Heating phase after activation.



After activation and start, the slow heating phase will start without manual intervention. By pressing the quick heating button MELT/TURBO, you can switch over to the normal heating function. Now, the fat will be heated more quickly. The heating relay will no longer cycle based on the times set in parameters **P71** and **P72** but based on the PID function set via the PID parameters. The cycle end defined via parameter **P73** does not have any influence after the manual intervention. To undo the switch-over, press the MELT/TURBO button again. Now, the heating relay will cycle like before the manual change-over again.

The manual change-over function can be used for reducing the heating phase if the fat has melted visibly and can be heated at a higher rate without any damage. Manual change-over between slow heating and turbo heating is possible only if the controller actually is in the heating phase, i.e. below the threshold set via parameter **P73**. Above this threshold, the turbo button has no function.

Heating phase after significant cooling.

After significant cooling to temperatures below 50 °C, e.g. loading of large quantities of cold fat, a slow heating phase will start, although the change-over to normal heating mode is effected earlier; the heating relay clocks like in the initial heating phase. Thus, manual change-over to normal heating function is only effective for the current heating phase and will become ineffective as soon as the setpoint is reached, at the latest. After that, as well as after mains failure

and restart, the controller is in normal operation mode with slow heating phase when the controller is switched on and started or restarted later or in the case of cool-down to temperatures below 50 °C. The switch-back threshold can be set via parameter **P79**.

**Locking of automatic burner device in the case of heating mode “Gas+Fan”:**

Control to setpoint with “burner clocking”:

To obtain a better control to the setpoint in the case of heating mode “Gas+Fan”, clocking of the automatic burner device can be activated. If the correcting variable percentage determined by the control part is smaller than the lower speed limit of the fan defined in parameter **P61**, the fan remains at this minimum speed and the automatic burner device is clocked until the setpoint is reached.

In this case, the control part calculates the on phases from 0...100 % based on the correcting variable values, with a minimum on time / minimum off time being enforced by parameter **P59**. The feedback is handled such that the time between the activation of the heating output and the receipt of the feedback signal is not considered as effective on time. Thus, the effective on time will start only upon receipt of the feedback signal.

Below the burner clocking range, the automatic burner device will always be on at first. Above the burner clocking range, i.e. after the setpoint was reached, the automatic burner device and the fan are switched off if the correcting variable becomes zero. For the fan, lead and delay times as well as a start-up boost are always effective.

If burner clocking is deactivated, the automatic burner device will always be switched on below the setpoint, and the control is affected by defining the fan speed based on the correcting variable, within the limits specified via parameters **P61** and **P62**, across the whole proportional range. Above the setpoint, the automatic burner device and the fan will be switched off.

Gentle heating with “heating clocking”

Two operation modes are available for gentle heating of cold fat, with the effective correcting variable always being defined via the ratio of the on and off times in **P71** and **P72**.

Heat clocking with fan:

If **P56**=2 the so-called heating clocking is affected only via the fan, the burner will be on permanently. The speed value of the on phase is defined by **P64**, in the off-period, the minimum value defined by **P61** is valid. Note that the percentage value specified in **P64** is relative to the area of **P61** ... **P62**. Further the final value of the “on-period” is not reached in case of very short turn-on times in **P71** because the fan speed increase is reduced with parameter **P63**.

### Heat clocking with burner:

If  $P56=3$ , the heating clocking is affected by switching the automatic burner device on and off at the time values defined in  $P71$  and  $P72$ , with the fan always maintaining its minimum speed according to  $P61$ . Parameter  $P64$  has no function in this operation mode.

### Heating with "Superturbo"

To obtain always instant heat output in case of need, you can change and activate the switch option to "Superturbo" with  $P16$ . Now the Melt/Turbo button activates the thermostat control, provided that the limit of  $P73$  is exceeded. This mode is called "Superturbo" and applies to all operating modes until reaching the one time switch-off limit that was established with  $P15$ . Thereafter, switch again to "Superturbo", if necessary. So you can toggle with the button above the limit from  $P73$  between the PID control and the thermostat behaviour, in which the hysteresis of  $P2$  is effective. If you switch within this hysteresis to "Superturbo", the heating is switched on immediately and only from then on, the hysteresis will be activated. Once "Super Turbo" is active, there are no burner cycles.

Above the cut-off line, which was established with  $P15$ , the Melt/Turbo button is blocked because an active "Superturbo" was already deactivated and should remain also inactive. You can only switch back to slower heating (melt function) below the limit from  $P73$ .

Please note that the switch option to "Superturbo" remains in those named limits if the controller was configured as a pure thermostat with  $P54$ . In this case, the switch does not create a change in the control behaviour, and it is recommended to disable the "Superturbo" in  $P16$ . On the other hand, you can activate "Superturbo" if you waive in special cases the gentle heating phase with  $P78$ .

The status of "Superturbo" is always displayed with a flashing buttons light, it doesn't matter how  $P17$  is configured

### Switch-off delay for heating relay:

With parameter  $P18$ , you can define a switch-off delay for the heating relay which is effective in all operation modes. The parameter is provided for cases, where the ignition of the gas heating is always delayed.

Caution: The setting  $P18$  must be done taking utmost care, as it is active independent of the control part. For this reason, short cycle times might result in unintended permanent heating.

## Operation of the timer group

### Version without multiple start (tic=0):

#### Single start:

After the start of a timer it is not possible to select or start another timer. At the end of a timer the buzzer sounds and the LED of the concerning timer flashes while the buzzer is on.

With parameter  $P28$  the buzzer can be specified for continuous or pulsating operation.

#### Basket activity:

If the basket operation is activated ( $P75>0$  and  $P76>0$ ) the basket is lowered at start of the timer and is raised at every stop of the timer.

By keeping pressed the Stop key the timer is cancelled and the basket is raised.

If the basket operation is deactivated ( $P75=0$  and  $P76=0$ ) the basket is not lowered or raised. The timer works as above.

Please note that it is mandatory to always adjust both parameters  $P75$  and  $P76$  either to "0" or to a time value!

### Version with multiple start (tic=1):

#### Multiple start:

After the start of a timer it is possible to select another time and start the timer. In the display you always see the time of the selected timer and the LED of this timer is on. At the end of a timer the buzzer sounds and the LED of the concerning timer flashes while the buzzer is on.

The display shows the time of the selected timer and the LED of this timer is on.

It is possible to start all 5 timers simultaneously, however a multiple start of a single timer is not possible!

With parameter  $P28$  the buzzer can be specified for continuous or pulsating operation.

#### Basket activity:

If the basket operation is activated ( $P75>0$  and  $P76>0$ ) the basket is lowered at every start of a timer and is raised at every stop or end of a timer.

If the basket is raised or the Start/Stop key is pressed, the lapse of all timers is interrupted and can be continued by restarting.

It is possible to finally stop all timers by pressing the Start/Stop key for more than 4 seconds.

If the basket operation is deactivated ( $P75=0$  and  $P76=0$ ) every timer works independently and only the currently selected timer is started, stopped or cancelled. By pressing the Start/Stop key for more than 4 seconds all timers are cancelled.

Please note that it is mandatory to always adjust both parameters  $P75$  and  $P76$  either to "0" or to a time value!

### Longer blinking of the timer lamps:

It is possible to let the timer lights flash at timer end for up to 3 minutes. This results in a longer signalling of expired timers, if only a short buzzer period. With parameter  $P29$  the flashing duration is specified, at  $P29=0$  is no further flashing.

The flashing can, like the buzzer, be acknowledged with the down button. If a multi-start occurred, the flashing of all timers is always acknowledged together.

### Flashing during timer sequence, at buzzer sound and after a timer has expired:

If  $P37=2$ , flashing already takes place in a fast flashing cycle during the timer sequence. If an flashing time is set in  $P29$ , flashing now takes place in a slow flashing cycle during the buzzer time. After the buzzer is off, the flashing continues for the specified time, still in a slow flashing cycle. This flashing can again be acknowledged with the down key for all timers together.

Note once again that the flashing of the timer lamps on expiry or after the end of the timer can only apply to unselected timers if several timers are expiring or have expired.

Display	Cause	Remedy
E I	Sensor error (Heating relay and analogue output are switched off!)	Check sensor
Ptc	Sensor error on compensation element for thermocouple measurement (P9 I=1,2)	Repair of controller
UEb	Overtemperature at E2 (P35=0, P52=1)	—
Hot	Overtemperature at E2 (P35=1, P52=1)	—
FRt	Alarm of the LowFat or NoContact control settings	Check oil level and/or switch on/off by pressing OFF button
EP	Error in parameter memory	Repair of controller
Oil Control active	Warning message, fat operating time is exceeded (see P82)	Acknowledge with the temperature DOWN key
Oil Control blocked	Control is blocked,, fat operating time is exceeded (see P82)	Acknowledge with the MELT and START key
rES	Reset of fat operating time (see P86)	—
Display flashing	Threshold alarm (P25=1)	—
Timer lamp flashing	Timer has elapsed (see P27 and P29)	Acknowledge with the DOWN key
Lamp "HEAT" flashing slowly	Burner fault (see P58)	Switch on/off by pressing OFF button
Lamp "HEAT" flashing quickly	Burner restart chance (see P58)	Waiting for restart or burner malfunction
Lamp "MELT2" flashing slowly	Thermostatic "Super Turbo" is active	
--- flashing during setup	Button lock (P I9=1)	—

<b>Analogue inputs</b>	<b>F1:</b> Temperature sensor Pt100 or thermocouple TC Measuring range: Pt100 -80...+400 °C TC -50...+400 °C Measuring accuracy referred to controller at 25 C: +/-0.5 K and +/-0.5 % of measuring range
<b>Digital inputs</b>	<b>E1:</b> External start-stop button <b>E2:</b> Overtemperature signal contact from temperature limiter
<b>Switching outputs</b>	<b>K1:</b> Relay, 8(1.5) A / 250 V~, normally-open contact (heating contact) <b>K2:</b> Relay, 8(1.5) A / 250 V~, normally-open (control contact 2) <b>K3:</b> Relay, 8(1.5) A / 250 V~, normally-open (raise basket) <b>K4:</b> Relay, 8(1.5) A / 250 V~, normally-open (lower basket) <b>K7:</b> Relay, 8(1.5) A / 250 V~, change-over contact (alarm contact) <b>S2:</b> Linear analog output with 0 to 20 mA output range
<b>PWM output</b>	<b>S1:</b> PWM output 3.6 KHz, output of PID correcting variable for control via a fan
<b>Power supply</b>	100 ... 240 V~ 50/60 Hz
<b>Connectors</b>	Screw terminals, grid 5.00 mm, for cables up to 2.5 mm <sup>2</sup>
<b>Ambient conditions</b>	Storage temperature -20...+70 °C Operating temperature 0...55 °C Relative humidity max. 75 % r.H., no condensation
<b>Weight</b>	approx. 600 g
<b>Enclosure type</b>	IP65 front, IP00 rear
<b>Protection class</b>	Protection class II, rated voltage 250 V~
<b>Interface</b>	Shielded 2-wire cable, twisted pair, maximum cable length 1000 m Interface driver: RS485, galvanically not isolated. The network must be designed in line topology with termination resistor of 120 Ohm on both sides.
<b>Installation data</b>	The display unit is designed for installation in a switching panel (note dimensioned drawing). Front size: 154.8mm x 61.8mm Assembly size: 180 x 87mm Assembly depth: approx. 25mm

