ROHDE

Instruction Manual

Control unit ST 410/ST 411

ST 410/ST 411

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1. Introduction

1.1. Preface

You have chosen an ST 410/ST 411 controller, a high-quality product for your kiln. This controller series incorporates the latest technological features, is being continuously developed and is the leader in its class.

After reading this instruction manual, you will be familiar with the functionality of the ST 410/ST 411 controller.

Please make sure that you fully understand the kiln manufacturer's safety instructions. Make sure that the control unit is mounted at a safe distance from the kiln and is not exposed to direct heat from the kiln. Do not place the control unit on top of the kiln.

The images shown in this instruction manual illustrate the functions and may differ in some ways from the actual product.

1.2. Scope of delivery

No.	Part	Remark
1	ST 410 or ST 411 control unit	Type varies depending on the version
2	Control unit bracket	For attachment to the kiln or wall
3	Mounting material for bracket	For attachment to the kiln or wall
4	USB flash drive	Data transfer of recorded measured values
5	Instruction Manual	

2. Control unit description

2.1. Product features

ST 410/ST 411:

- 32 programs with up to 32 segments each
- 1 controlled heating/cooling ramp + soak per segment
- Soak times up to 99 hours 59 mins
- Ramp rates from 1 to 999°C/h or "FULL"
- Ideal for glass or ceramics use
- Programs can be altered while the kiln is in operation
- Program pause facility
- Program advance facility
- Keylock
- Program start delay facility – up to 99 hours 59 mins
- Continuation of kiln operation after a power failure
- Displays energy used
- Setpoint display
- Alarm buzzer
- Buzzer
- Temperature display either in °C or °F
- USB interface for data logging

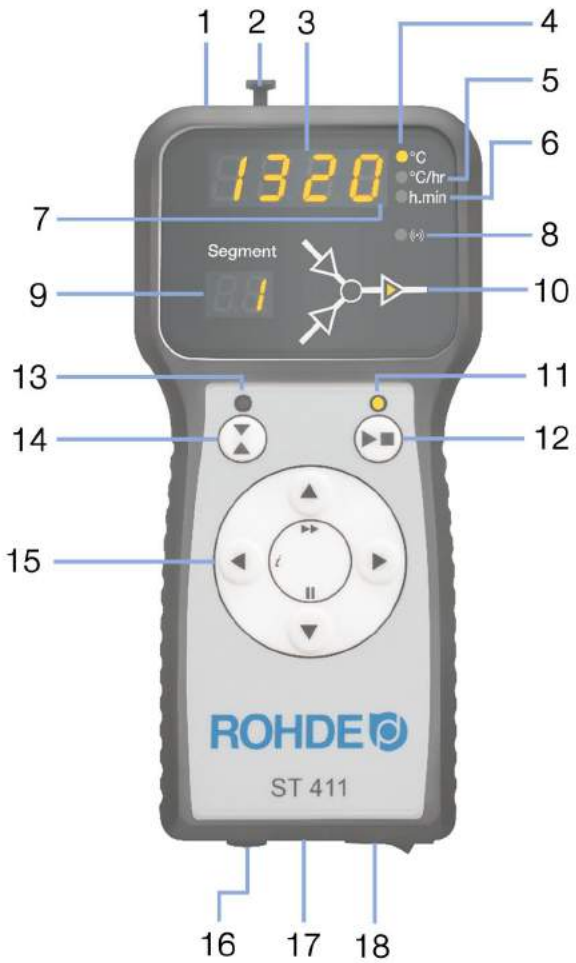
ST 411 only:

- Integrated Wi-Fi module for connection to a wireless network
- Additional programmable switch output (e.g., automatic exhaust air flap)
- Optional "hysteresis" control for photovoltaics / PV systems (contact the manufacturer)

2.2. Technical information

Information	Description
Protection class	2
Degree of pollution	2
IP rating	IP50
Supply	100-240 V, AC, 50-60 Hz, 1.0 A
Fuse	Micro-fuse, 3.15 A, 5 x 20 mm, slow-blow, ceramic, HRC ROHDE item no.: 704851
Ambient temperature	-5°C to +30°C
Weight	0.5 kg
Housing dimensions	Width 80/68 mm x height 165 mm x depth 28 mm
Housing material	Plastic, ABS, flame retardant, UL 94V-0
Bracket material	Plastic, ABS, flame retardant, UL 94V-0
Connection cable	Length 2 m, insulation PU, CPC 14 connector
Thermocouple	type R, type S, type K, type N

2.3. Control unit overview



No.	Description	ST 410	ST 411
1	USB port	X	X
2	“USB flash drive plugged into USB port” indicator	X	X
3	Main display	X	X
4	“Temperature” indicator	X	X
5	“Ramp rate” indicator	X	X
6	“Time” indicator	X	X
7	“Kiln heating” indicator	X	X
8	“Data transfer” indicator	X	X
9	Segment display	X	X
10	Graphical program operation display	X	X
11	“Program running” indicator	X	X
12	Start/stop key	X	X
13	Switch output (event) indicator	–	X
14	Switch output key (event)	–	X
15	Control keys (including the “INFO key [i]”)	X	X
16	Fuse	X	X
17	Cable with CPC 14 connector (connection to the kiln)	X	X
18	Mains switch	X	X

2.4. Connector features

The control unit is connected to the kiln via a 14-pin connector.

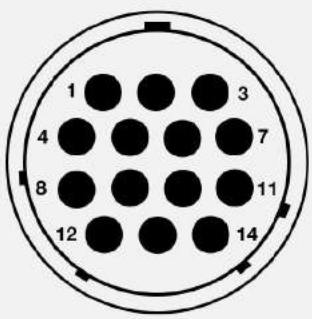
Features:

- CPC 14 connector
- 14-pin screw connection
- Bayonet fitting

The black 14-pin socket provided for this is located on the switch cabinet of the kiln (near the electrical supply line).

CPC 14 kiln socket	CPC 14 controller plug
	

2.5. Plug pin assignment

Pin no.	X = Used	Description	Pin assignment
1	X	Thermocouple 1 +	
2	X	Thermocouple 1 -	
3	–	Not used	
4	–	Not used	
5	–	Not used	
6	–	Not used	
7	X	Additional switch output (230 V)	
8	X	L1 feed 230 V AC	
9	X	N feed	
10	–	Not used	
11	–	Not used	
12	X	Safety contactor switch output	
13	X	Neutral conductor switch output	
14	X	Zone 1 switch output	

Note:

- Each switch output can switch a maximum of 250-300 mA at 230 V.
- A relay must be used at these outputs to switch loads.
- The wiring of the mating CPC 14 socket can vary between kiln manufacturers! Non-observance can result in damage to the controller and kiln.

2.6. Kiln contactor protection circuit

The coil of each kiln contactor should be suppressed with an RC circuit. RC circuits must be connected directly across the coil terminals on each contactor. ROHDE kilns are delivered this way as standard. For kilns from other manufacturers, suitable products are available as accessories from contactor manufacturers.

Attention!
If the contactors are not suppressed by a varistor, the controller can be damaged.

3. Safety instructions

Adhere to all safety and warning instructions for the control unit and observe the operating instructions and the information on the warning signs for the kiln to which the control unit is connected.

⇒ Keep the instruction manuals for the control system and the kiln so
- that they are always accessible to everybody who works on the kiln and
- that they are always close to the kiln.

DANGER

Disregarding this instruction manual can lead to serious personal injury, property damage and even death.
⇒ Please make sure that you fully understand this instruction manual.
⇒ Only use the control unit if it is in technically perfect condition!
⇒ Observe the operating instructions for the kiln to which the control unit is to be connected.
⇒ Please make sure that you fully understand the kiln manufacturer's safety instructions.

DANGER

Working with an improperly connected control unit and kiln or an electrically defective control unit and kiln can lead to serious personal injury, property damage and even death.
⇒ Check the kiln and the control unit regularly to ensure that they are in proper and perfect condition before using the equipment for the first time and during operation.
⇒ Have the kiln checked regularly (at least once a year) to ensure it is in perfect working condition.
⇒ Only have the tests carried out by a qualified electrician.
⇒ In the event of damage or defects, do not put the control unit or kiln into operation or shut down both immediately.

DANGER

Disconnect the kiln and control unit from the power supply before attempting installation or repair work.
⇒ Risk of severe personal injury, property damage and even death.

WARNING

An incorrectly placed control unit can lead to serious personal injury or property damage.
⇒ The control unit should never be placed on the kiln but should only be positioned in the bracket provided for it.

WARNING

An incorrectly connected control unit can lead to serious personal injury or property damage.
⇒ Please make sure that you follow the specifications in this instruction manual and the operating instructions for the kiln.
⇒ Make sure that only a properly connected control unit is put into operation.

NOTE

Do not open the device cover.
⇒ There are no user-serviceable parts inside.

4. Mounting

4.1. General safety note

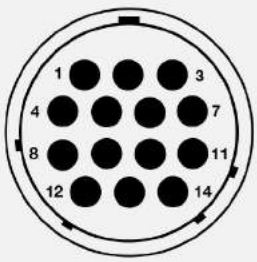
WARNING

An incorrectly placed control unit can lead to serious personal injury or property damage.
⇒ The control unit should never be placed on the kiln but should only be positioned in the bracket provided for it.

4.2. Mounting the bracket

- The control unit comes with a suitable mounting bracket which can be attached to the kiln or at the operation location (near the kiln or on a wall).
- The bracket is attached with 2 screws.
- Note the direction of the arrow while the bracket is being installed (arrow direction = up).
- Never place the control unit on the kiln but use the bracket instead.
- When mounting on the kiln, the bracket is mounted on a suitable controller mounting plate or the switch box.
- Please refer to the operating instructions for the kiln.
- When mounting on a wall, the bracket is screwed directly to a wall near the kiln using the fastening material supplied.
- The appropriate mounting material is included in the scope of delivery.

4.3. Connecting the connection cable

Step	Description	View on plug
1	Insert the plug of the control unit into the socket on the kiln.	
2	The plug and socket have a geometric coding – the plug and socket only fit together in one position.	
3	The wide lug on the plug must be at the top in the 12 o'clock position to fit into the wide recess on the plug, also in the 12 o'clock position.	
4	You may have to twist the plug a little until it clicks completely into the socket.	
5	Tighten the outer screw ring on the plug clockwise.	

4.4. Control unit extension cable

- If the bracket for the control unit is attached at the operation location (near the kiln or mounted on a wall), the cable can be extended using an extension cable.
- The extension cable for the control systems is optionally available in lengths of 2.5, 5 or a maximum of 10 meters.
- Note on extension cables and environmental influences due to EMC:
  - To meet the requirements for electromagnetic compatibility (EMC), the length of the controller connection cable should not exceed 3 meters.
  - If the controller is connected to the kiln with an extension cable, it should be ensured that there is no electrical device in the direct vicinity of the cable (electromagnetic stray field).
  - Otherwise, a loss of accuracy of up to 3°C could occur.

4.5. Third-party kiln note

The wiring of the mating CPC 14 socket on the kiln can vary between kiln manufacturers!

Attention!
If the assignments of the controller and kiln do not match, then there is a risk of damage to both the controller and kiln.

5. Installation

5.1. Switching the control unit on & off

The rocker switch for switching the control unit on and off is located on the underside of the housing.

Switching the control unit on	Set the rocker switch to position “I”.	
Switching the control unit off	Set the rocker switch to position “0”.	

5.2. Quick start guide

- Switch on and wait for the kiln temperature display.
- Call up firing programs with the ▶ key.
- Select the firing program with the ▼ or ▲ key.
- To start the selected program, press the ▶■ key.
- To stop the firing at any time, press the ▶■ key again.
- The firing data and the programming mode can be called up again with the ▶ key.
- Change the firing data and change the displayed value with the ▼ or ▲ keys.
- Use the ▶ key again as necessary to step to the next firing value or segment to be reviewed or changed.
- Use the ◀ key to switch back to the previous value.
- To mark the end of a program, set the ramp rate to END with the ▼ key.
- To exit programming mode, either wait 20 seconds or press the ▶■ key to start firing.

6. Operation & use

6.1. Keylock

Step	Action	Display screen
Unlock keys		
1	If any key is pressed and "LOC" appears in the display, the keys are locked.	LOC
2	To unlock, press the ▲ and ▼ keys and hold it down for 5 seconds until "ULOC" appears in the main display.	ULOC
Lock keys		
1	To lock, press the ▲ and ▼ keys and hold it down for 5 seconds until "LOC" appears in the main display.	LOC
2	If any key is pressed and "LOC" appears in the display, the keys are locked.	LOC

6.2. INFO key ◄

6.2.1. General description

The INFO button ◄ can be pressed at any time to obtain additional information. It doesn't matter whether the controller is running a program or not.

6.2.2. Operation

INFO key ◄	Description
Key pressed once	The maximum temperature of the current program is displayed.
Key pressed twice	The currently consumed energy is displayed in kWh (parameter P14 must be set).
Key pressed 3 times	The current setpoint is displayed.
Key pressed 4 times	The controller shows the current temperature again.
Note	⇒ After 10 seconds, the INFO display returns to the normal display (current kiln temperature), if no button is pressed. ⇒ The INFO display can be ended immediately by pressing either the ► or ▼ or ▲ button.

6.3. Display screens after switching on

6.3.1. Display screens after switching on

Step	Display	Icon	Description
1	8.8.8.8.	● °C ● °C/hr ● h.min	• After switching on, the controller carries out a display test. • All indicators light up. • The controller will sound a short beep.
2	F6.03	○ °C ○ °C/hr ○ h.min	• The controller displays the version number of the integrated software. • When contacting technical customer support, you will need: – the version number – the serial number of the device
3	tC.S	○ °C ○ °C/hr ○ h.min	• The thermocouple type setting is now displayed. • This should match the type of thermocouple fitted to the kiln and can be R, S, K or N.
4	20	● °C ○ °C/hr ○ h.min	• The final display shows the kiln temperature. • No other illuminated elements should not light up during this time.
5		○ °C ○ °C/hr ○ h.min	• If any graphical display LEDs are on, then the control unit is firing. • The firing process can be stopped with the ⏯ key.

6.3.2. Display in firing mode

Display	Icon	Description
411.	● °C ○ °C/hr ○ h.min	During firing, the illuminated (decimal) point to the right of the temperature (“411”) in the display shows that the kiln is heating up.

6.3.3. Segment display

Display screen Segment	Description
oC	When the controller is switched on, the segment display shows the possible temperature units during operation (°C/°F). The temperature units can be configured as parameters (see Section 12.).
oF	

6.4. Firing segments

6.4.1. Explanation of firing segments

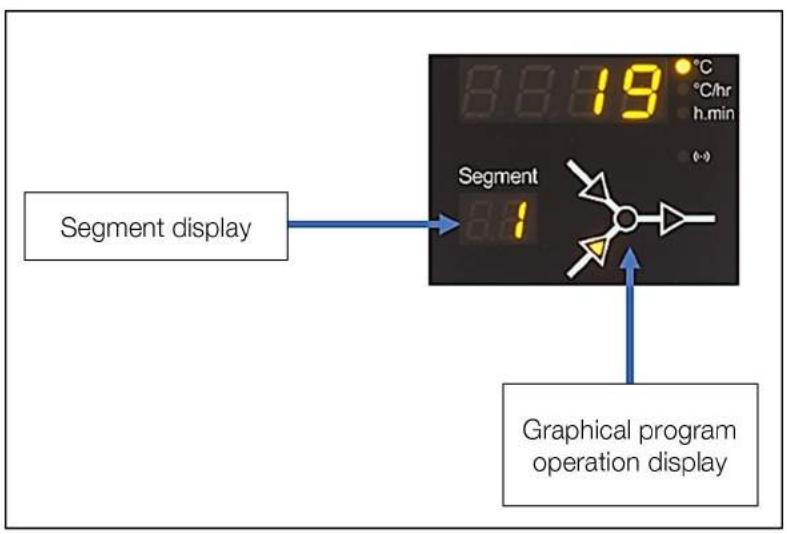
Each firing program consists of individual firing segments. Each firing segment consists of 3 values. The 3 values of a firing segment are:

- a heating (1.1) or cooling ramp (1.2)
- the soak or target temperature (2)
- a soak time (3)

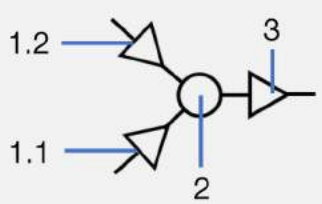
When programming a firing program, the three values must be entered for each segment.

During programming and the course of a firing program, the graphical display shows which value of the respective firing segment is currently selected or which is currently running with an illuminated LED display.

The "Segment" display shows which segment you are currently in during programming and the program run.



Graphical program operation display:

Value	Meaning	Graphical program operation display
1.1	Heating ramp	
1.2	Cooling ramp	
2	Soak Temperature (target temperature)	
3	Soak time	

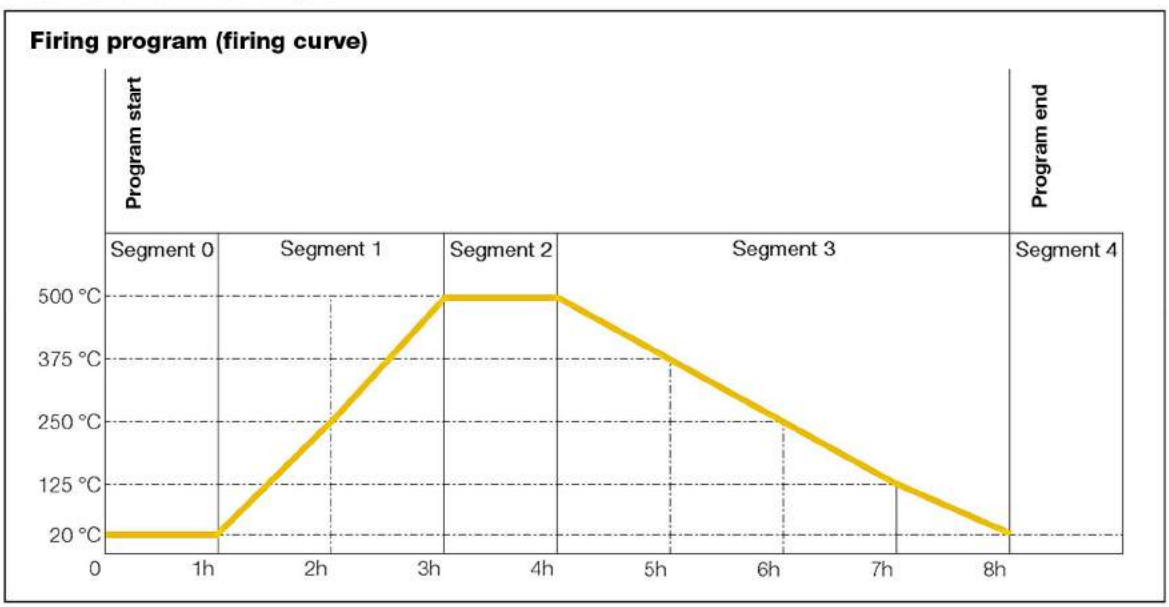
⇒ There is only either one heating ramp (1.1) or one cooling ramp (1.2) per firing segment - never both!

6.4.2. Example of a firing program to illustrate the firing segment

Example of a simple firing program to illustrate the firing segments and their values:

Firing segment	Firing segment values	Description of the values
0	Program delay or program start delay (see Section 8.1.3.)	Program delay = 1 h (60 min) ⇒ The firing program starts with a delay. (Factory-set to 00 hours 00 min.)
1	Heating ramp (1.1)	Heating at 250°C/h
	Target temperature (2)	Heating up to 500°C
	Soak time (3)	Hold for 0 min
2	Heating ramp (1.1)	Heating at 0°C/h
	Soak temperature (2)	Hold at 500°C
	Soak time (3)	Hold for 60 min
3	Cooling ramp (1.2)	Cooling at 125°C/h
	Target temperature (2)	Cool to 20°C
	Soak time (3)	Hold for 0 min
4	Cooling ramp (1.2)	Setting the value to “END” ends the firing program.
	Target temperature (2)	-
	Soak time (3)	-

Visualisation of the example:



Firing program sequence:

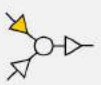
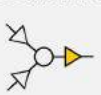
- The temperature rises at the entered, ascending ramp (heating up) [ramp rate] until the kiln reaches the soak or target temperature.
- It then soaks (dwells) at the soak temperature for the soak period.
- It then runs the next segment until the end of the program is reached.
- It is possible to control ascending ramps (heating up) & descending ramps (cooling down).
- Ascending ramps (heating up) and descending ramps (cooling down) are referred to as the "ramp rate".
- The ramp rate is set in values between 1 and 999°C/h or as “FULL” (full load heating) or “END” (end of the program).
- The soak/target temperature is settable over the range 0 to 1320°C (2408°F).
- The soak period is settable over the range 00:00 (no soak) to 99 hours 59 mins.

Note:
During soaking, the kiln temperature and the remaining soak time appear on the display at intervals of 15 seconds.

User information:
For simple firing such as biscuit firing, two segments are sufficient, more complex firings such as crystal glazes or glass production require several segments.

6.5. Programming the control unit

6.5.1. Changing the firing program

Display	Icon	Meaning	Description
20	● °C ○ °C/hr ○ h.min	No program in operation	• If no firing is carried out, no element lights up in the program sequence of the graphical display. • The firing indicator also does not light up. • The main display shows the current firing chamber temperature.
Pr. 1	○ °C ○ °C/hr ○ h.min	Program number	• When you press the ▶ key, the program number lights up on the display. • The firing program can now be selected with the ▲ and ▼ keys. • By pressing the ▶ key again, the program number which is to be changed can be selected. • You can switch back to the previous value in each step by pressing the ◀ key.
1	Segment 	Indicator in the segment display	The selected firing program always shows the first segment first.
150	○ °C ● °C/hr ○ h.min	Heating ramp  Cooling ramp 	• The ramp rate in the main display appears as: ⇒ "1°C/h-999°C/h" or ⇒ "FULL" or ⇒ "END" • This can be altered with the ▲ & ▼ keys. • The graphical display indicates whether a heating ramp or a cooling ramp is being programmed. Notes: ⇒ To change the heating ramp to a cooling ramp and vice versa, see Section 6.4.2. ⇒ To program the ramp rate to "FULL" or "END", see Section 6.4.3. ⇒ To program the additional switch output see section 7.
600	● °C ○ °C/hr ○ h.min	Soak/Target temperature 	• The next press of the ▶ key displays the soak or target temperature. • This can be altered with the ▲ & ▼ keys.
00.15	○ °C ○ °C/hr ● h.min	Soak time 	• The next push of the ▶ key displays the soak period in "hours:minutes". • This can be altered in the range 00:00 to 99:59 with the ▲ and ▼ keys. • The soak period indicator on the graphical display will flash. Note: To program the additional switch output see section 7.
2	Segment 	Indicator in the segment display	The next press of the ▶ key increments the segment number digit and firing values for the next segment can be entered.

Display	Icon	Meaning	Description
End	○ °C ○ °C/hr ○ h.min	End program input 	To mark the end of the program: • Push the ▼ key until "END" appears in the main display. • To end the program input, press the ▼ key. ⇒ Program input is also automatically terminated if the maximum number of segments have been entered. ⇒ If "END" is not entered in the last segment, the controller issues the error message "Error P" when the program starts.

*The keys ▲ or ▼ can also be held down for faster input.

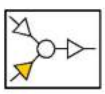
Note:

- It is possible to exit programming mode without performing all of the steps described above. To do this, wait 20 seconds without pressing a key and the controller will revert to the idle display. All changes are automatically applied and saved immediately.
- Alternatively, exit the programming mode with the ▶■ key and start the firing process immediately; all changes made are automatically saved, however.
- The ◀ or ▶ keys can be used to cycle through the programming steps to correct errors or to exit programming mode.
- The switch output (event) can be added or deselected by pressing the switch output (event) key while programming the heating ramp, cooling ramp and soak time (see Section 7.).

6.5.2. Changing the firing program: Programming the heating or cooling ramp

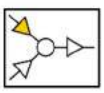
When changing the firing program, the heating rate in the firing segment often has to be changed from a heating ramp to a cooling ramp and vice versa.

Heating ramp:



If the soak/target temperature of the selected segment is higher than or equal to the soak/target temperature of the previous segment, the controller displays a heating ramp in the selected segment.

Cooling ramp:



If the soak/target temperature of the selected segment is lower than or equal to the soak/target temperature of the previous segment, the controller displays a cooling ramp in the selected segment.

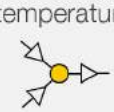
Changing a heating ramp to a cooling ramp:

Display	Icon	Meaning	Description	Remark
Pr. 1	○ °C ○ °C/hr ○ h.min	Program number	Select the firing program that is to be changed.	See Section 6.4.1.
3	Segment 	Indicator in the segment display	Select the segment with the heating ramp to be changed into a cooling ramp.	See Section 6.4.1.
150	○ °C ● °C/hr ○ h.min	Heating ramp 	Press the ▶ key to switch to the soak or target temperature.	A heating ramp is set in the selected segment.

Display	Icon	Meaning	Description	Remark
600	°C °C/hr h.min	Soak/Target temperature 	This can be altered with the ▲ & ▼ keys.	The temperature in the selected segment is higher than in the previous segment. ⇒ Soak/target temperature in the previous segment (2) = 599°C
598	°C °C/hr h.min	Soak/Target temperature 	The ▼ key reduces the value, and the ◄ key makes the display return to the ramp rate.	
150	°C °C/hr h.min	Cooling ramp 	A cooling ramp is now set in the selected segment.	From here on, the segment can be fully programmed as a cooling ramp.

*The keys ▲ or ▼ can also be held down for faster input.

Changing a cooling ramp to a heating ramp:

Display	Icon	Meaning	Description	Remark
Pr. 1	°C °C/hr h.min	Program number	Select the firing program that is to be changed.	See Section 6.4.1.
3	Segment 	Indicator in the segment display	Select the segment with the cooling ramp to be changed into a heating ramp.	See Section 6.4.1.
150	°C °C/hr h.min	Cooling ramp 	Press the ► key to switch to the soak or target temperature.	A cooling ramp is now set in the selected segment.
599	°C °C/hr h.min	Soak/Target temperature 	This can be altered with the ▲ & ▼ keys.	The temperature in the selected segment is lower than in the previous segment. ⇒ Soak/target temperature in the previous segment (2) = 600°C
601	°C °C/hr h.min	Soak/Target temperature 	The ▲ key increases the value, and the ◄ key makes the display return to the ramp rate.	
150	°C °C/hr h.min	Heating ramp 	A heating ramp is now set in the selected segment.	From here on, the segment can be fully programmed as a heating ramp.

*The keys ▲ or ▼ can also be held down for faster input.

6.5.3. Programming the “FULL” & “END” ramp rates

Programming a “FULL” heating or cooling ramp in the firing program:

Display	Icon	Meaning	Description	Remark
Pr. 1	○ °C ○ °C/hr ○ h.min	Program number	Select the firing program that is to be changed.	See Section 6.4.1.
1	Segment 1	Indicator in the segment display	Select the segment with the heating ramp to be changed into a cooling ramp.	See Section 6.4.1.
150	○ °C ● °C/hr ○ h.min	Heating ramp  Cooling ramp 	The ramp rate for the heating or cooling ramp is shown in the main display.	Possible main display: 1°C/h-999°C/h
FULL	○ °C ● °C/hr ○ h.min	Heating ramp  Cooling ramp 	Press or hold down the ▲ key until “FULL” appears in the main display.	• “FULL” heats or cools as fast as possible. • The “END” value is one step above the ramp rate “999°C/h”.

*The keys ▲ or ▼ can also be held down for faster input.

Programming the “END” of a heating ramp or cooling ramp in the firing program:

Display	Icon	Meaning	Description	Remark
Pr. 1	○ °C ○ °C/hr ○ h.min	Program number	Select the firing program that is to be changed.	See Section 6.4.1.
1	Segment 1	Indicator in the segment display	Select the segment with the heating ramp to be changed into a cooling ramp.	See Section 6.4.1.
150	○ °C ● °C/hr ○ h.min	Heating ramp  Cooling ramp 	The ramp rate for the heating or cooling ramp is shown in the main display.	Possible main display: 1°C/h-999°C/h

Display	Icon	Meaning	Description	Remark
End	○ °C ● °C/hr ○ h.min	Heating ramp  Cooling ramp 	To mark the end of the program, push the ▼ key until "END" appears in the main display.	• END" ends the firing program. • The firing program ends with the segment in which "END" has been programmed. • After "END" has been programmed, the soak/target temperature or soak time can no longer be selected. • The "END" value is one step below the ramp rate "0,1 °C/h". Note: If "END" is not entered in the last segment, the controller issues the error message "Error P" when the program starts.

*The keys ▲ or ▼ can also be held down for faster input.

7. Programming the additional switch output (ST 411 only)

7.1. General description (ST 411 only)

The ST 411 control unit has an additional switch output which can also be programmed as a firing program.

⇒ The switch output on the controller can control an automatic exhaust air flap, an automatic intake air flap or an automatic cooling system using a fan on the kiln separately or simultaneously.
⇒ Each switch output can switch a maximum of 250-300 mA at 230 V.
⇒ A relay must be used at these outputs to switch loads.

7.2. Configuring parameters for switch output (ST 411 only)

The additional switch output can be set in the parameter configuration (see Section 12. / Parameter no. 45).

Additional switch output	Parameter	Value	Description
Switch output 1	No. 45	1	Event 1

7.3. Possible assignment of the switch output (ST 411 only)

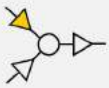
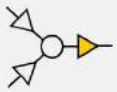
Additional switch output 1 (Event 1):

⇒ With this setting, the switch output is controlled in such a way that its status changes at the beginning of a ramp (heating and cooling ramps) or soak period.
⇒ Events are possible with a ramp as well as a soak period.
⇒ Example for assignment:
The kiln has an automatic air damper that should close at the beginning of a ramp (heating or cooling ramp) or soak period and should open again at the end of a ramp (heating or cooling ramp) or soak period.

7.4. Event programming (ST 411 only)

When programming a ramp or a soak period – while programming a firing program – the switch output can also be selected for the respective program step by pressing the switch output (event) key.

7.4.1. Event programming

Main display	Meaning	Switch output indicator	Description
Heating or cooling ramp			
150	Heating ramp  Cooling ramp 		**Event 1:** While programming a ramp, press the ⧗ key to select event 1.
Soak time			
00.15	Soak time 		**Event 1:** While programming a soak time, press the ⧗ key to select event 1.

7.4.2. Switch outputs (event) indicator

Switch output	Switch output indicator	Description
Event 1 ON		The indicator LED for the switch output (event) lights up (relay contacts are closed).
Event OFF		The indicator LEDs for the switch output do not light up (relay contacts are open).

Note:
Before the program runs, the switch output (event) is inactive (relay contacts are open).

8. Instructions for use

8.1. Firing

8.1.1. General operation

The firing process starts by pressing the ⏯ key and is indicated by the "Program running" indicator for the duration.

⇒ The firing process can be ended at any time by pressing the ⏯ key again which makes the "Program running" indicator go out.
⇒ The firing process can be restarted by pressing the ⏯ key. When you restart, the firing program starts again from the beginning.
⇒ After a restart, you can use the program advance function (see Section 8.1.4.) to skip the individual steps in the program until you are back at the correct segment.

Note 1:

- Press the ⏯ key to start the firing process - it is recommended that you first check the program numbers and values with the ▶ key.
- It is also a good idea to have a written record of the contents of the firing programs kept and displayed near the kiln especially if there is more than one user of the kiln.

Note 2:

- Note: during ramping the controller will perform either controlled heating or controlled cooling – as indicated on the graphical display.
- During soaking the controller display alternates every 15 seconds between kiln temperature and soak period remaining.
- At the end of each segment, the segment number indicator is incremented.

8.1.2. Operation using the ⏯

- If the ⏯ key is pressed during firing, it will be halted (not paused).
- Pressing the ⏯ key again will restart the firing from the beginning.
- The controller will look at the current kiln temperature and if this is greater than the required soak temperature then it will automatically cool from the current temperature to the soak temperature.
- Since this process may not be desired, the ⏯ key should only be used to abort the firing process in an emergency.
- The program can be paused, or program data can be changed while the controller is firing. This procedure is preferable to using the ⏯ key.

8.1.3. Program delay

The program delay or program time delay can be used to delay the start of the firing program to a specific point in time.

⇒ The program delay can be entered or changed immediately after the start of the respective program.
⇒ Immediately after pressing the ⏯ key, "00.00" appears in the main display. The waiting time before the firing starts can be set with the ▲ and ▼ keys.

Display	Icon	Description
00.00	○ °C ○ °C/hr ● h.min	While the firing indicator light is flashing on the display, a program start delay of up to "99 hours:59 minutes" can be entered using the ▲ and ▼ keys.

⇒ The firing process can be started by pressing the ▶■ key again or will do so automatically after 5 seconds. The "Program running" indicator continues to signal that a firing is in progress.
⇒ For technical reasons, there is a point between the hours and minutes in the display and not a "colon" as is usual with times.

Note:
The program delay for the delayed start for each firing process is set to "00.00" in the factory.

8.1.4. Program advance function

- While firing press and hold down the ▲ key for 3 seconds to obtain the program advance function.
- The controller will emit a short beep and immediately advances the program by one step.
- The process is indicated accordingly in the course of the program on the graphical display by a flashing icon.
- The effect of this is as follows:
  - If ramping, then the controller will switch to soak at the current kiln temperature.
  - If soaking, then the controller will advance to the next segment if any, or else it will end the firing.
- Changes made to the operation of the controller in this way are temporary and are not stored.

8.1.5. Program pause facility

General safety note:

WARNING

Risk of serious damage to property due to too long a soak time when using the program pause function.

⇒ If left too long at high temperatures, kiln damage could result.
⇒ The program pause function causes the program to pause but the temperature is still maintained!
⇒ Leaving the ware too long at high temperatures could damage it or have a negative impact on the firing results.

Operation:

Step	Description	Remark
Activating the program pause facility	The program pause facility is activated by pressing the ▼ key.	The controller sounds a short beep, the current program is paused and the current kiln temperature is maintained.
Ending program pause	The program pause is ended by pressing the ▼ key.	The paused firing program continues.

Indication in the display:

Display	Icon	Description	Remark
PAUS	○ °C ○ °C/hr ○ h.min	• While paused, the kiln temperature display will alternate periodically with a scrolling "PAUSED" display • and a beep will be sounded.	• Program execution is suspended, and the kiln will be held at its current temperature. • The pause will come to an end automatically after a preset period. • The pause function is preset to 2 hours at the factory.

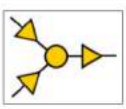
8.2. Notes on the firing process

8.2.1. Querying kiln performance

- The controller operates by calculating the amount of energy required by the kiln every 30 seconds (installer adjustable).
- The benefit for the user is that the power consumed is displayed at the end of the firing.
- Before the controller can display the required amount of energy in kilowatts, parameter no. 14 (see Section 12.) must be set with the kiln performance.
- The consumption values can only be called up during firing or at the end of the firing curve. If the controller is switched off or a new program is started, the consumption values are deleted.
- To check the required amount of energy in kilowatts (consumption values):
  Press the ◄ key (a small "i" is shown next to this arrow key).
- If for example 40% of full energy is required to maintain a particular ramp rate or a particular soak temperature then the controller will apply heating power to the kiln for 12 seconds every 30 seconds.
- The kiln heating indicator will light for 12 seconds every 30 seconds.
- If the kiln has a contactor, then a loud click will be heard both when the kiln heating indicator lights up and when it goes out. If full heating power is required, then the kiln heating indicator will remain lit. If full cooling is required, the kiln heating indicator will remain off.

8.2.2. Cooling

Upon completion of firing the controller lights all LEDs on the graphical display. The kiln is switched off and begins to cool down on its own.



Displays during the cooling phase:

Display 1	Icon 1	Display 2	Icon 2	Description
411	● °C ○ °C/hr ○ h.min	HOt	○ °C ○ °C/hr ○ h.min	As long as the kiln temperature is above 40°C, the display alternates between display 1 & 2 every 5 seconds.
39	● °C ○ °C/hr ○ h.min	End	○ °C ○ °C/hr ○ h.min	⇒ As soon as the kiln has cooled down below 40°C, the display alternates between display 1 & 2 every 5 seconds. ⇒ The firing program runs until "END" is displayed.

⇒ To switch the controller back to idle condition, press the ⏭ key. It can now be switched off.

8.2.3. Recovery in the event of a power failure

- In the event of a power failure during the firing, the controller can automatically continue the firing after the power failure.
- In the event of a power failure during the program delay, the start is delayed by the remaining program delay when the mains voltage returns.
- In the event of a power failure during the ramping, the controller continues the ramp it had been executing.
- In the event of a power failure during the soak period, the controller goes to the soak temperature at the set ramp rate and then carries out the remaining soak period.

8.3. Operating notes

8.3.1. Kiln too slow

- If the control unit is programmed to heat the kiln at a faster rate than the kiln is capable of then the control unit will turn on full power and then wait until the kiln temperature has risen to the correct temperature before proceeding to the next ramp or soak segment.
- If the control unit is programmed to cool the kiln at a faster rate than the kiln is capable of then the control unit will apply zero power and then wait until the kiln temperature has cooled to the correct temperature before proceeding to the next ramp or soak segment. That is, as soon as the kiln has reached the desired temperature.

8.3.2. Heating & cooling ramps

- The control unit is capable of controlled ramps for both heating and cooling.
- The type of ramp required is determined by comparing the required soak temperature to the soak temperature in the previous segment. The ramp is then shown during the firing on the graphical display.
- With a normal cooling ramp, the cooling is not "active (fan cooling system)" but natural. With natural cooling, the heat lost by the kiln is compensated for by targeted heating so that it only cools down very slowly. This technique is usually only used in glass fusing.

8.3.3. Introduction of cooling air in cooling ramps

NOTE

The introduction of cooling air using a blower or fan at a firing chamber temperature of more than 600°C can damage the insulating material or heating elements.

⇒ Cold air may only be brought in at a temperature below 600°C.
⇒ The fan cooling system must never run during the firing process!
⇒ The cooling system is only switched on below 600°C when the kiln is in cooling mode and is not being heated anymore!
⇒ The exhaust air opening must be open when a cooling blower or cooling fan is in operation.
⇒ Early cooling is not recommended as this can have a negative impact on the ceramics, glazes and the durability of the kiln lining and the service life of the heating elements.

The manufacturer assumes no liability for damaged insulation material or heating elements if the instructions have not been followed.

8.3.4. Memory

As soon as the controller is turned off, all programs and necessary data are saved and retained.

8.3.5. Adjusting the firing values during firing

During the program, certain firing values can be changed using the controller:

- Use the ▶ key to select the desired parameter during the firing process.
- The parameter is indicated accordingly in the course of the program on the graphical display by a flashing icon.
- The firing value is shown on the main display and can be adjusted with the ▲ and ▼ keys in the usual way.
- The contents of the current segment or any segment still to be executed can be changed.
- Firing will still carry on as normal while these changes are being made.
- The controller will return to its normal running display 20 seconds after key presses cease (or immediately after "END" is displayed).
- Changes made to programs in this way are stored and are used for subsequent firings.

8.4. "Hysteresis" regulation for photovoltaic systems (ST 411 only)

The ST 411 control system is factory-set to control a kiln that is provided with electrical energy from a central power supply (PID). If electrical energy is provided at the installation site by a photovoltaic/PV system to operate the kiln, the factory control (PID) may not be adequate. It might be useful to configure the optional "hysteresis" regulation for photovoltaic/PV systems in the ST 411 controller. Especially, this is true if the photovoltaic/PV system is also equipped with a storage battery (electricity storage/battery storage).

If you use a photovoltaic/PV system to operate your kiln and would like advice on the optimal control behavior of the ST 411 control system, please contact the manufacturer.

The optional "hysteresis" regulation for photovoltaic/PV systems can be configured without replacing the ST 411 control system, but the device may have to be sent to the manufacturer for configuration or a service appointment may be necessary on site.

9. Error messages

9.1. General description

If the control unit detects a problem, the buzzer will sound, and an error message will be displayed.

9.2. Display screen

Display	Description
Main display	This error message will alternate with a display of the kiln temperature.
Segment display	Displays the respective segment number where the error may have occurred.

9.3. Reading error messages

Step	Activity	Remark
1	Press the ◀ key to obtain more information on the error.	The first press will display the maximum temperature reached in the firing.
2	Press the ◀ key again to display the length of time the error has been present.	The buzzer will mute.

9.4. General error messages

Display	Description	Cause of error / Troubleshooting
Err. 0	Internal data error	The controller cannot be repaired on site and must be sent to the manufacturer for repair.
Err. 1	• Heating error. • The kiln temperature is not increasing as required. • The kiln has been on full power for 15 minutes, but the temperature has not increased by at least 2°C.	• Kiln door or lid not completely closed. • Defective door switch • Door switch needs to be adjusted. • Heating element circuit open • Heating elements too old • Electrical power phase failure • Contactor failure
Err. 2	Thermocouple or wiring for thermocouple disconnected.	• Get thermocouple and wiring checked. • Replace thermocouple if necessary.
Err. 3	Thermocouple wired incorrectly	• Kiln temperature apparently below -40°C • This is an installation fault. • Get wiring checked.
Err. 4	• Cooling error • The kiln has been on zero power for 30 minutes, but the kiln temperature has not fallen by at least 1°C.	• Contactor failure (contacts possibly welded) • Thermocouple disconnected or resistance too high.
Err. 5	Set kiln temperature exceeded. Desired temperature / Permissable excess: below 100 °C: +60 °C over 100 °C, below 200 °C: +50 °C over 200 °C, below 600 °C: +30 °C over 600 °C: +20 °C	• The kiln temperature has exceeded the desired temperature by a preset limit. • The cause of the excess temperature must be determined. • The contactor is not working (contactor hanging/replace contactor).
Err. 6	The maximum duration of the firing process exceeded.	The duration of the firing process exceeds a limit value set in the factory. ⇒ Deactivated at the factory. ⇒ If you want to set a maximum firing time, please contact ROHDE Service.
Err. 7	The maximum room temperature exceeded.	• The internal temperature of the controller has exceeded a factory-set limit value. • Factory set to 50°C. • Possible causes: – insufficient or incorrect ventilation of the kiln – operating location too small – ventilation grille blocked – exhaust air flap not closed – controller mounted too close to the kiln

Note:

- Each of the listed error messages leads to the termination of the firing process.
- Terminating the firing process protects the kiln from damage.
- The alarm buzzer will sound once per second.
- To reset the controller, turn off the power to the device and have the fault investigated and rectified by your installer or kiln service engineer.

9.5. Firing program errors

Display	Description	Cause of error / Troubleshooting
Err.P	Program error: • This error message is displayed if a potential error is detected within the firing program when the ⏭ key is pressed to start a firing. • A buzzer sounds three times and the segment number at which an error may have occurred appears on the segment display.	• Press the ▶ key and the error message will be deleted. • The controller now changes to programming mode. • The program in which the error may have occurred can be called up and changed if necessary. • If no fault is found, then press the ⏭ key again to force the firing program to start.

10. Interfaces

10.1. USB interface

10.1.1. General description

The interface enables a USB flash drive to be connected to the controller. This is mainly used to generate files with a timestamp and to store them on a computer for data logging. Data acquisition via USB is mainly used with ROHDEgraph (see Section 10.3.). It can also read configuration and user-program data files into the controller.

10.1.2. Interface properties

General safety note:

PROHIBITION

Do not connect any other devices, except a USB flash drive, to this USB interface.

⇒ No devices such as cell phones or laptops may be plugged into this USB interface to charge the battery.

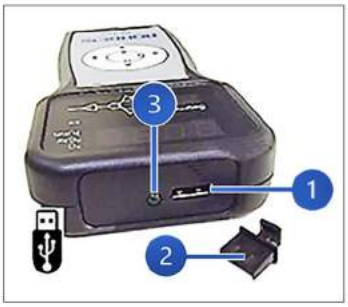
Description:

- USB versions 1.0 or 2.0 are suitable for recording the measured values.
- USB 3.0 is not compatible.
- The USB flash drive must be formatted to FAT32 or FAT16.
- NTFS format is not suitable.
  The data logger module has been tested with common USB flash drives of 8, 16 and 32 GB.
- The "USB flash drive plugged into USB port" indicator on the top of the housing confirms connection with a compatible USB flash drive.

10.1.3. Inserting & removing USB flash drives

The USB port (1) for inserting the USB flash drive is located on the top of the housing, under an easily removable cover (2).

- Keep the USB port cover attached and plug it in when not in use.
- The USB flash drive may only be plugged into the controller or removed when no data is being written to it.
- To insert and remove a USB flash drive, the controller does not have to be switched off.
- The "USB flash drive plugged into USB port" indicator (3) on the top of the housing goes out as soon as the flash drive is removed.



10.1.4. "Data transfer" indicator

Display	Description
	The "data transfer" indicator flashes when information is being written to the USB flash drive.

10.1.5. Real-Time clock function

- This data logger module incorporates an accurate battery-backed real-time clock to display the date and time of day.
- It compensates for leap years.
- It does not automatically compensate for daylight saving in summer and winter.
- This clock is used to timestamp data within the data logger files. It is also used to date and time stamp the actual file.
- Note:
  The date and time stamp of the file is the time the file was last written to (not the time when the file was first created).
- The battery is designed for a service life of around 10 years.

10.1.6. Setting the date & time

Requirements for setting:

1. Switch on the controller
2. No firing process in progress

Carry out setting:

Step	Display	Segment display	Description	Remark
1			Switch on the controller	
2			Press the ◀ key and hold it down for at least 5 seconds until "Date" setting mode appears.	The date is shown in "YY.MM.DD" format.
3	21.01	01	Navigate to the flashing digit with the ▶ or ◀ key.	After the call-up, the numerical value for the year flashes first.
4	21.01	01	Use the ▲ and ▼ keys to change the flashing number.	

Step	Display	Segment display	Description	Remark
5	21.01	01	Move onto the next digit with the ▶ key.	The last numerical value for the day of the current date is in the segment display.
6	21.01	01	Move to "Time" setting mode by pressing the ▶ key from the flashing day display.	
7	01.01	01	Navigate to the flashing digit with the ▶ or ◀ key.	The time is now shown in HH.MM.SS format.
8	01.01	01	Navigate to the flashing digit with the ▶ or ◀ key.	After the call-up, the numerical value for the hour flashes first.
9	01.01	01	Use the ▲ and ▼ keys to change the flashing number.	
10	01.01	01	Move onto the next digit with the ▶ key.	The last numerical value for the second of the current time is in the segment display.
11	01.01	01	To exit Settings: • Press the ▶ key while the seconds display is flashing to exit "Time" setting mode. • Or wait 15 seconds.	

10.1.7. Data logging

- Data logging commences when a firing is started.
- It finishes when the firing is complete and when the kiln has cooled to 100°C.
- The "LOGxyz.CSV" file is generated on the USB flash drive.
- The first file created will be "LOG000.CSV".
- Subsequent firing processes will generate files "LOG001.CSV" to "LOG999.CSV".
- Only 1000 log files in total can be created on the USB flash drive.
- It is recommended that you move the log files to another storage medium after a few firing processes.
- It takes about 1 second until the individual files are indexed on the flash drive and only then can a new file be created.
- So, for example, if there are files LOG000.CSV to LOG100.CSV on the USB flash drive there would be a delay of just over 100 seconds before LOG101.CSV could be created and logging could be commenced.
- The files are generated in CSV file format and ASCII code and can be imported directly into Microsoft Excel tables.

10.1.8. Logging interval

The interval can be set in configuration mode with parameter P50 in a range between 5 and 300 seconds (see Section 12.).

Preset value: 60 seconds

10.1.9. Log file format

Year	Month	Day	Hour	Minute	Second	Kiln Temperatur	Setpoint	Ambient Temperature	Program	Segment	Event	Status
2018	4	1	20	8	52	26.7	28	24	7	1	0	Heating ramp
2018	4	1	20	9	7	26.7	28	24.2	7	1	0	Heating ramp
2018	4	1	20	9	22	26.7	28	24	7	1	0	Heating ramp
2018	4	1	20	9	37	26.7	28	24	7	1	0	Heating ramp
2018	4	1	20	10	52	26.7	28	24	7	1	0	Heating ramp
2018	4	1	20	10	7	26.7	28	24	7	1	1	Heating ramp
2018	4	1	20	10	22	26.7	28	24	7	1	1	Heating ramp
2018	4	1	20	10	37	26.7	28	24	7	1	1	Heating ramp
2018	4	1	20	10	52	26.7	28	23.9	7	1	1	Heating ramp

Note:

- A value of "1" in the "Event" column indicates that the switch output was active in the completed firing program at the specified time. In these cases, the switch output (event) indicator lights up above the event key on the front of the controller.
- A value of "0" in the "Event" column indicates that the switch output was not active in the completed firing program at the specified time. In these cases, the switch output (event) indicator above the event key on the front of the controller does not light up.

10.1.10. Saving on USB flash drive

The control system does not overwrite any files that have already been created on the inserted USB flash drive. It is recommended that you regularly move files that have already been generated from the USB flash drive to a computer, to save the files for evaluation and not to exceed the storage capacity of the flash drive.

10.2. Wi-Fi module (ST 411 only)

10.2.1. General description (ST 411 only)

The control unit can be connected to a wireless network (Wi-Fi).

10.2.2. Functions possible with Wi-Fi (ST 411 only)

Various functions between the control system (kiln) and a computer, tablet or smartphone can be carried out using a Wi-Fi connection. The Wi-Fi connection is mainly used with the ROHDE App myKiln (see Section 10.4.).

Possible function:

- Measured values recorded by the controller can be sent wirelessly to a computer, tablet or smartphone for evaluation.
- The kiln operation can be observed and monitored in real-time from a computer, tablet or smartphone (ROHDE App myKiln).
- Firing program data can be loaded onto the controller using ROHDE App myKiln.

10.2.3. "Data transmission" indicator (ST 411 only)

Display	Description
	The "Data transmission" indicator light flashes when information is being sent over the wireless network.

10.2.4. Establishing a connection via a Wi-Fi router [WPS function)] (ST 411 only)

Connecting the ST 411 control unit to a wireless network (Wi-Fi):

Step	Description of the process	Remark
1	Switch the control unit off.	
2	Press the ▲ key and switch on the control unit.	
3	Hold down the ▲ key when switching on.	
4	Hold down the ▲ key until "PAIR" appears in the main display.	
5	Release the ▲ key.	To connect the control unit to a wireless network (Wi-Fi).
6	Press the WPS key on the wireless router.	Information on the WPS key on the wireless router can be found in the router's instruction manual and generally on the Internet.
7	After a few seconds, "PAIR" disappears from the main display and the control unit shows normal information in the main display.	
8	The ST 411 control system is now permanently connected to the wireless network (Wi-Fi).	If this procedure was unsuccessful, repeat the steps starting with step 1 or try the connecting as described in Section 10.2.5.
9	Connecting the computer, tablet or smartphone to the Wi-Fi.	Available networks can be searched for on the computer, tablet or smartphone in the system settings.

10.2.5. Establishing connection manually with a wireless router (ST 411 only)

Process to manually connect an ST 411 control unit to a wireless network using a computer, tablet or smartphone:

Step	Description of the process	Remark
1	Switch the control unit off.	
2	Press the ▼ key and switch on the control unit.	Hold down the ▼ key while switching on.
3	Hold down the ▼ key until "AP" appears in the main display.	1) "AP" stands for Access Point. 2) The control unit creates its own wireless network. 3) The wireless network via the access point is limited in time and is closed each time the controller is switched off.
4	Release the ▼ key.	
5	Using a computer, tablet or smartphone, manually search for a wireless network (Wi-Fi) or access point.	⇒ The computer, tablet and smartphone need to activate Wi-Fi and scan for new devices. ⇒ Available networks can be searched for on the computer, tablet or smartphone in the system settings. ⇒ The control unit and the computer, tablet or smartphone must be in the immediate vicinity.
6	A wireless network named "Controller" should appear.	
7	Connect the device to the wireless network called "Controller".	Ignore the following warnings from your computer, tablet or smartphone: - The internet is not available. - This wireless network has no internet access. Connect anyway. - Unsecured network - The process of connecting to the Wi-Fi may take a while. - Similar warnings may vary depending on the device used.
8	Open the web browser on your computer, tablet or smartphone.	Executable with all common web browsers.
9	Enter "192.168.100.1" in the address bar and go to this address.	This so-called "web interface", which is now displayed in the web browser, consists of 2 tabs, but only the displayed "Wi-Fi Connection" tab is important for establishing the connection.
10	A list of available wireless routers is now displayed in the "Wi-Fi Connection" tab.	The web interface scans for available wireless networks in the area and displays them in a list.
11	The appropriate wireless router should now appear as available in this list.	
12	Select the wireless router in the web interface and enter the access data for it.	You should find the access data in the documents attached to the wireless router.
13	Confirm with Save/OK and close the web browser.	A successful connection to the wireless router is displayed.
14	The controller now automatically disconnects from the computer, tablet or smartphone because a new connection to the wireless router has been established.	The controller now permanently sets up the wireless network with the router. ⇒ If this was not successful, repeat the steps, starting with step 1, try the connecting as described in Section 10.2.4.
15	Switch off the controller and switch it on again immediately.	The controller is now permanently connected to the Wi-Fi router that has been set up.

10.3. ROHDE graph

10.3.1. General information

ROHDEgraph is computer software for the visualisation and archiving of firing curves from the recorded measured values of the control system.

Record data		The firing data is automatically recorded during firing with the controller and a USB flash drive.
Transfer to PC		The logfile from the controller can be transferred to the PC with a USB flash drive.
Evaluate and save		The log data is processed on the computer with ROHDEgraph in Excel and displayed as a firing curve.
System		Windows/Mac and a current version of Microsoft Excel.

Information, function and software download at:

www.rohde.eu/graph

10.3.2. Meaning of the controller status codes in ROHDEgraph

Folgende Bedeutungen haben die Werte in der Spalte “Controller Status” im Log-File von ROHDEgraph. In the ROHDEgraph log file, the values in the “Controller Status” column have the following meanings.

Code-Number	Description
1	The controller is in idle (no program is running).
2	The controller performs a start delay.
7	The controller performs a heating ramp.
8	The control program has/was paused during a heating ramp.
9	The controller performs a cooling ramp.
10	The control program has/was paused during a cooling ramp.
11	The controller performs a soak time.
12	The control program has/was paused during a soak time.
13	After the end of a program, the kiln cools down but the temperature is still above 40 °C.
14	The kiln has cooled down, the temperature is below 40 °C.
15	The controller displays the error message "Error 0” (internal data error).
16	The controller displays the error message "Error 1“ (heating up to slow).
17	The controller displays the error message "Error 2“ (thermocouple failure)).
18	The controller displays the error message "Error 3“ (thermocouple reversed).
19	The controller displays the error message "Error 4“ (cooling down to slow).

Code-Number	Description
20	The controller displays the error message "Error 5" (temperature overshoot).
21	The controller displays the error message "Error 6" (program runtime hours exceeded).
22	The controller displays the error message "Error 7" (ambient temperature trip).

Note:
In the log file, the code numbers 1 & 2 are normally not displayed, since the log file is only filled when a program is active.

10.4. ROHDE App myKiln

10.4.1. General informationen

ROHDE App myKiln is an application for the visualisation, archiving, creation, editing or managing of firing curves from the recorded measured values of the control system.

Create an account		Create a free account and register the controller there with the "Access code".
Connect to Wi-Fi		Connect the controller and device (computer, tablet or smartphone) to the Wi-Fi.
Record data		The firing data is automatically recorded in ROHDE App myKiln during firing with the controller.
Monitoring and evaluating		The firing data is displayed and saved as a firing curve in ROHDE App myKiln.
Send program data		Create, edit or manage firing program data and load it onto the controller with ROHDE App myKiln.
System		Internet-capable device (computer, tablet or smartphone) and a Wi-Fi access point for connecting the controller to the Internet.

Informationen, FAQ and free account at:

app.rohde.eu (Web)

myKiln in the App Store (Android)

myKiln in the App Store (Apple)

10.4.2. Register the controller in ROHDE App myKiln (“Access code”)

To register the controller in ROHDE App myKiln, the controller's “Access code” is required. This “Access code” is located on the back of the controller. Each controller with an integrated module for wireless data transmission has its own unique “Access code”.

11. Faults

11.1. Safety instructions

DANGER

Disconnect the control unit and kiln from the power supply before troubleshooting and repair work.

⇒ Risk of severe personal injury, property damage and even death.

NOTE

In the event of faults that you cannot rectify yourself, contact a qualified electrician, the local specialist or the manufacturer.

NOTE

In the event of faults which have to do with the kiln itself to which the control system is connected, the instruction manual for the kiln must be followed.

NOTE

Do not open the device cover.

⇒ There are no user-serviceable parts inside.

11.2. General faults

Fault	Cause	Solution
The control unit cannot be switched on.	The kiln is not supplied with electricity.	⇒ Check the supply line/mains plug of the kiln. ⇒ Check the fuses of the house connection of the kiln. ⇒ Observe the operating instructions for the kiln.
	A safety device on the kiln has triggered and has completely switched off the energy supply to the furnace.	Observe the operating instructions for the kiln.
	The control unit cable is not connected to the kiln or the connection is incomplete.	Check the connection cable.
	The key switch for switching on the control system on the kiln is switched off.	Observe the operating instructions for the kiln.
	The fuse in the control unit has tripped and must be replaced.	Observe Section 11.3. in this instruction manual.
The control unit is showing an error message.	An error has occurred in the operation of the control system.	Observe Section 9. in this instruction manual.

11.3. Replacing the control unit fuse

If the control unit cannot be switched on and other faults have been excluded, replace the fuse in the housing of the control unit.

Required spare part: 3.15 A T micro-fuse
ROHDE item no.: 704851

Replacing the fuse:

Step	Activity	Remark
1	Switch the control unit off.	
2	Switch off the kiln completely.	Set the main switch on the kiln to the “0/OFF” position or pull the power plug.
3	Disconnect the control unit connection cable from the kiln.	
4	Remove the fuse carrier on the underside of the housing. 	Tool: 7 mm slotted screwdriver Place the tool in the slot in the fuse holder.

Step	Activity	Remark
5	1) Press in the fuse holder a little with the tool. 2) Meanwhile, turn the fuse holder a little anticlockwise so that it releases from the lock. 	Tool: 7 mm slotted screwdriver The fuse carrier is equipped with a so-called bayonet fitting.
6	Remove the fuse carrier with the fuse from the housing. 	
7	Insert a new fuse. ⇒ The fuse can be inserted in both directions.	Fuse type: 5 x 20 mm / 3.15 A T micro-fuse ROHDE item no.: 704851
8	Reinstall the fuse in reverse order.	Tool: 7 mm slotted screwdriver
9	Connect the control unit connection cable to the kiln.	
10	Switch on the kiln.	Set the main switch on the kiln to the “I/ON” position or plug in the power plug.
11	Switch the control unit on.	
12	Check the control unit is working.	If the control unit still cannot be switched on, contact a qualified electrician, the local specialist or the manufacturer.

12. Parameter configuration

12.1. Available parameters

Parameter no.	Parameter function	Min. value	Max. value	Default setting	Description of the value
14	Kiln performance display in kW	0	9999	0	1 unit = 0.1 kW E.g.: For a kiln with an output of 10 kW (see kiln nameplate), enter the value "100".
45	Additional switch output 230 V (ST 411 only)	0	1	1	0 = disabled 1 = event **2/3 = ATTENTION: Parameter 2 or 3 must not be used if it is available!!!**
50	Logging interval data on USB in s	5	300	60	1 unit = 1 s (second)
60	Temperature display in °C or °F	0	1	0	0 =°C 1 = °F

12.2. Changing parameters

Step	Display	Icon	Description	Remark
1			Switching the control unit off	
2	8.8.8.8.	● °C ● °C/hr ● h.min	Switch on the control unit and press the ▶■ key at the same time.	
3	tC.S	○ °C ○ °C/hr ○ h.min	Hold down the ▶■ key until the set thermocouple type is shown in the main display.	⇒ The thermocouple type is only displayed and cannot be changed here. ⇒ The thermocouple is preconfigured at the factory.
4	tC.S	○ °C ○ °C/hr ○ h.min	Release the ▶■ key.	
5	P14-	○ °C ○ °C/hr ○ h.min	The main display shows the first configurable parameter.	
6	P45-	○ °C ○ °C/hr ○ h.min	The parameter to be configured can be selected by pressing the ▲ and ▼ keys.	
7	0	○ °C ○ °C/hr ○ h.min	The set value of the parameter to be configured can be called up with the ▶ key.	
8	1	○ °C ○ °C/hr ○ h.min	This can be altered by pressing the ▲ & ▼ keys.	

Step	Display	Icon	Description	Remark
9	1	○ °C ○ °C/hr ○ h.min	The ▶■ key saves the value.	As an example, the value "1" has been set for parameter no. 45 (additional switching output).
10			The control system display goes dark for a moment and the control system restarts.	
11	20	● °C ○ °C/hr ○ h.min	After the restart, the control unit is ready for operation again.	The set value is now permanently saved for the respective parameter.

13. Example of a firing program

13.1. Program examples (ceramics)

Program no.	Description	Segment 1 " Ramp rate"	Segment 1 " Soak temperature"	Segment 1 " Soak period"	Segment 2 " Ramp rate"	Segment 2 " Soak temperature"	Segment 2 " Soak period"	Segment 3 " Ramp rate"
1	Initial firing 1050°C	100°C/h	1050°C	00 h:00 min	FULL/SKIP	1050°C	01 h:30 min	END
2	Biscuit firing 950°C	60°C/h	600°C	00 h:00 min	100	950°C	00 h:00 min	END
3	Earthenware 1050°C	150°C/h	900°C	00 h:00 min	100	1050°C	00 h:30 min	END
4	High-temperature stoneware 1250°C	150°C/h	900°C	00 h:00 min	60	1250°C	00 h:05 min	END

13.2. Information on firing programs

- The preset controller programs are simple sample programs for biscuit, earthenware and stoneware firing.
- These programs must be checked before firing to allow the firing temperature, heating rates and soak times to be adapted to the materials used.
- The variety of ceramic bodies, engobes, glazes and decorative colours as well as different types, sizes and performances of the kilns used, and individual furniture set assemblies, types and quantities of products to be fired make it difficult to make generally applicable recommendations.
- We advise against using uncontrolled full power heating ramps ("FULL") to protect heating elements and the kiln from unnecessary wear and to allow for repeatable firing results.
- The preset program no. 1 "Initial firing" is used for:
  - the initial firing of the kiln after commissioning
  - after replacing new heating elements (oxidation firing)
  - the initial firing of new furniture material (stilts and batts)
- When using program no. 1 "Initial firing", the inlet and outlet air openings of the kiln must be open. Please also consult the kiln instruction manual.

14. Cleaning the control unit

14.1. General safety note

CAUTION

The control unit and the kiln must not be hosed down with water jets, hoses or high-pressure cleaners for cleaning.

⇒ The possible consequences are:
- Damage to components,
- Impairment of functions
- Failure of control system and kiln

⇒ Always clean the control unit and kiln dry.

⇒ Do not use water or compressed air for cleaning.

14.2. Cleaning instructions

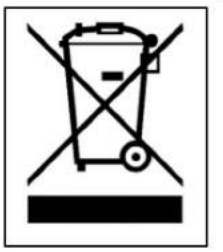
⇒ Remove contamination with a clean, dry cloth.

⇒ Do not use detergents.

⇒ Never spray the control systems with a water jet or high-pressure cleaner.

⇒ Never use compressed air.

15. Disposal of the control unit



The control unit must be properly disposed of at the end of its service life.

Electrical equipment must never be disposed of with general or household waste. This must be collected separately for proper disposal. In this way, you help with the recovery, recycling and reuse of raw materials.

To protect the environment, components and packaging that are easy to dispose of are predominantly used.

16. Additional Information

16.1. Warranty provisions

We guarantee the perfect workmanship and function of the delivered control unit and usually grant a 36-month warranty from the invoice date (except wear parts).

For exceptions to the warranty period, please refer to the invoice for the control unit.

In addition to wearing parts, the following items are excluded from the warranty:
- Fuses (wear part)
- Damage caused by the customer.
- Damage from heat and warmth because the control system was placed on the kiln.
- Damage due to improper handling.
- Subsequent modifications or changes to the control system that have not been authorised or approved in writing by the manufacturer.

Exclusion of any liability on the part of the manufacturer in the event of improper handling and resulting damage.

16.2. Property rights / Brand names / Disclaimer

There may be deviations in the content of this instruction manual, which are due to technical changes. The information in this instruction manual is checked regularly; necessary corrections are included in the subsequent editions. This instruction manual is not subject to the automatic update service. Common names, trade names, product descriptions etc. are reproduced in this instruction manual without special identification, as these are generally known. However, these names and designations could be the property of companies or institutes.

17. Declaration of Conformity

We declare that the relevant and basic requirements of the Low Voltage Directive 2014/35/EU have been met.

Manufacturer:

Helmut ROHDE GmbH
Ried 9
83134 Prutting
Germany

Community resident authorised to compile the relevant technical documentation:

Helmut ROHDE GmbH
Stefan Meier
Ried 9
83134 Prutting
Germany

This declaration of conformity of the product described below is issued under the sole responsibility of the manufacturer.

Description and identification

Product:	Control unit
Model:	ST 410/ST 411
Purpose:	Control of kilns for household, commercial and light industrial use

We also declare that the special technical documents were created.

The protection goals of the following additional EU directives have been met:

2014/30/EU	Electromagnetic Compatibility Directive
2012/19/EU	Waste Electrical and Electronic Equipment Directive

The following harmonised standards were used, among others:

EN 61010-1:2020-03	Safety regulations for electrical measuring, control, regulating and laboratory devices, Part 1: General requirements
EN 60204-1:2019-06	Safety of machinery. Electrical equipment of machines, Part 1: General requirements
EN 60335-1:2012-10	Household and similar electrical appliances. Safety. Part 1: General requirements

The technical documentation can be sent to a national authority following a justified request.

Prutting, January 16th, 2023

Benjamin Rohde (General Manager)

(Place and date)

(Signature)