

**bentrup**

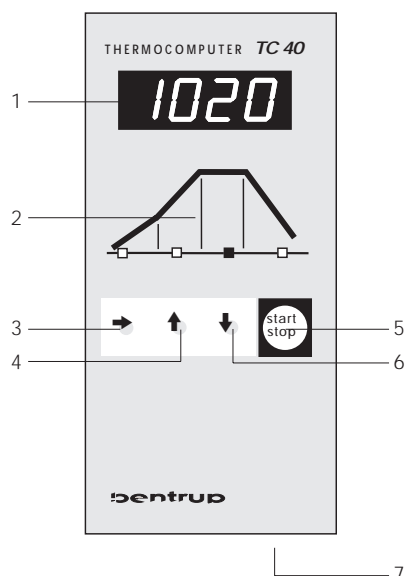
TC 40



# Operating Instructions

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## Controller Layout



- 1 display
- 2 firing curve with indicators
- 3 key for selecting the segment of the firing curve
- 4 key for increasing the displayed value
- 5 start/stop key
- 6 key for decreasing the displayed value
- 7 mains switch

## General Information

Your brand new bentrup TC40 represents one of the most popular kiln controllers of the compact class. The TC40 combines very easy handling, safe and precise kiln operation at a very reasonable price.

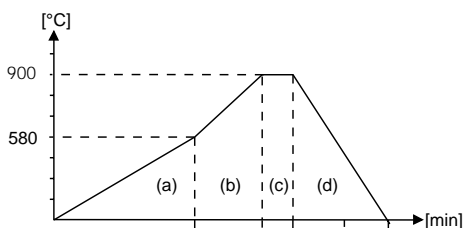
Before operating the TC40, please read and understand the manual carefully. This familiarizes you with all functions of the TC40 quickly and ensures that you can use all the capabilities of your control.

## Security Advice

Please refer to the security advice of the kiln manufacturer. Make sure that the control is mounted at a safe distance from the kiln and that the control is not exposed to direct heat or radiation when the kiln is opened whilst it is hot.

## Firing Curves

The microprocessor controller TC40 provides your kiln with a precise and reproducible controlling unit. The firing course is shown as a firing curve consisting of five segments. An example is shown below. This firing curve consists of the following segments:



- a. heating up to 580°C at 120°C per hour
- b. heating up to 900°C at maximum power
- c. dwell (30 minutes)
- d. natural cooling

For easier use, the TC40 has fixed values in the firing curve:

The rate of heating up can be set to the values 60°C/h, 120°C/h, 240°C/h, 360°C/h, 480°C/h and maximum power. The temperature for switching to maximum power is fixed at 580°C.

The final temperature can be adjusted between 400°C and 1320°C in 5°C steps. The dwell can be selected 0, 10, 20, 30, 60 minutes.

## Typical Firing Curves

Depending on application, clay, glaze etc. it required very different firing curves. Your dealer will assist you for detailed questions. Following firing curves are some typical examples:

Firing	heatup(°C/h)	final temp. (°C)	dwll
biscuit 800°C	120	800	10
biscuit 900°C	120	900	10
glaze 1050°C	240	1050	30
stoneware 1180°C	240	1180	30
stoneware 1250°C	240	1250	30

## Entering a Firing Curve

Example: The biscuit firing 800°C (refer to table shown above) is entered as a firing curve as follows:

Power on the controller by the mains switch. After a few seconds the actual kiln temperature appears on the display (1).

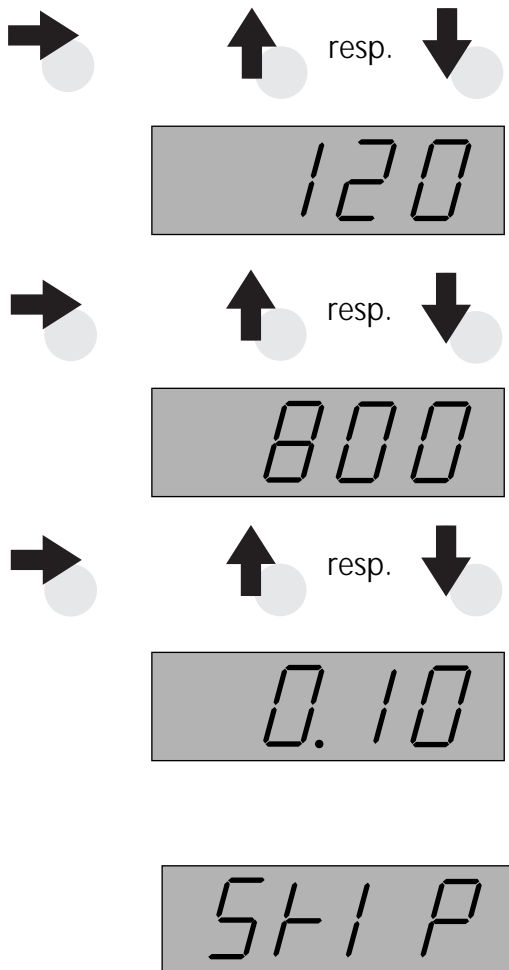
Press the key (3) once. The section (a) of the firing curve (2) lights up. The display (1) shows the actual rate for the heat up. Use the keys (4) and (6) to change this value to 120°C/h (as our example).

Press the key (3) again to select the next segment (b). Use the keys (4) and (6) to enter the required final temperature of the firing (800°C as our example).

If you hold the key (4) or (6) pressed, the displayed value will run through automatically.

Press the key (3) to step to the next segment of the curve (section c.). Adjust the dwell to the required value (e.g. 10 minutes).

Instead of a linear heat up (section a.) you can also enter an uncontrolled heat up, ie. with maximum power. This is done by setting the firing curve to SKIP in the section a. The value SKIP is shown as depicted left.



If you want to change a value again or you have skipped a segment unintentionally, use the key (3) to get back to the beginning of the firing curve. You can alter all values as often as you like.

To start the firing, press the key (5). The display (1) shows from now on always the kiln temperature. Additionally, the firing curve (2) indicates the current section of the firing.

The flashing decimal point in the right hand corner indicates programme running.



## Checking the Programme Values

To check or change the values of a programme when the firing has already been started, proceed as follows: Press the key (3), the firing is interrupted automatically (decimal point stops flashing). Now, you can step through the segments using the key (3) as described before. To change a value, use keys (4) and (6). To continue the firing with the new values press key (5) again.

## Reaction on Power Breakdown

For security reasons the firing will be interrupted if a power breakdown occurs. For special applications a version with power breakdown restart feature is available on request.

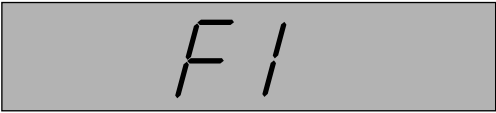
## Maximum Adjustable Values

heat up .....60°C to 480°C/h, SKIP  
end of heat up .....580°C (fix, configurable)  
final temperature .....400°C to 1320 °C\*  
dwell .....0.00 to 1.00 hours

*\* this value varies depending on the kiln*

## Error Messages

The integrated microprocessor inside your TC60 performs continuous checking of the firing process. In case of any malfunction the display will show an error message pointing to the problem. Following is a description of the possible error messages:



F1

**The kiln doesn't follow the required temperature increase.** This error message points clearly to a kiln problem. Possible cause:

- broken fuse, power phase or relay failed
- the door (lid) contact is open
- a heating element is broken
- the heating elements are too old (esp. with high firing temperatures)
- the thermocouple has a short circuit

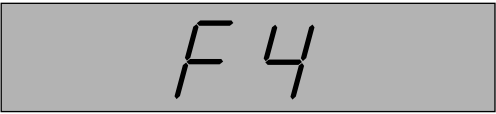


F3

### Thermocouple or thermocouple circuit defect

Possible cause:

- thermocouple broken
- thermocouple wiring bad
- contacts of the connecting plug bad



F4

### Impossible values on data acquisition

Possible cause:

- thermocouple polarized bad
- thermocouple temperature less than -15°C



F5

### Safety Switch Off features was activated

The TC60 has measured an overtemperature in the kiln and switched off the kiln by the 2nd power relay (if fitted). Check carefully the cause before using the kiln again to avoid further damage ! Ask your dealer for assistance.



## Error detected during power-up self check

On every power-up the controller performs a self check. If an error is detected the controller shows F8 (ROM error) or F9 (hardware error). Please contact your local dealer.

## Setting the Parameters of the TC40

This information describes how to adapt the TC40 to the kiln. Usually, this is done by the kiln manufacturer.

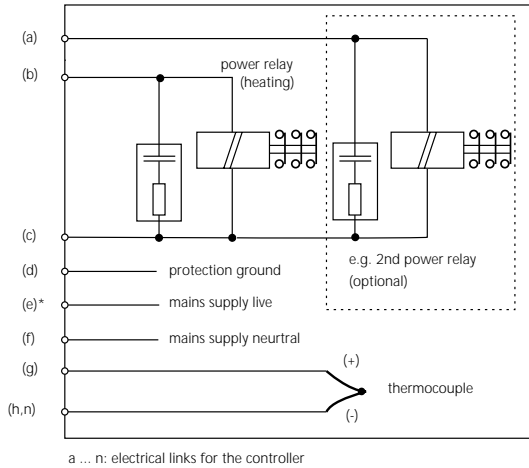
You can call up the parameters to view only; to change them, you need a special authorization code which is available from us on request.

To get into the parameter menu press the key start/stop and hold it pressed for about 4 seconds. Now, the display reads the first configurable value and you can step through the list by pressing the key (3).

code	usage	value range	unit
0	type of thermocouple S-R-K-J	0-3	-
1	max. adjustable temperature	20-1600	°C
2	proportional band	0.0-99.9	%
3	integral time	10-8000	s
4	derivative time	0-999	s
5	cyclus time power relay	1-100	s
6	units for temperatures °C - °F	0-1	-
7	lock error message F1 (heat up check)	0-1	-
8	temp. for switching over to full power	20-1600	°C

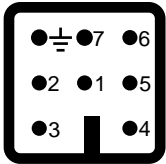
## Technical Informations

### Schematic of a Kiln

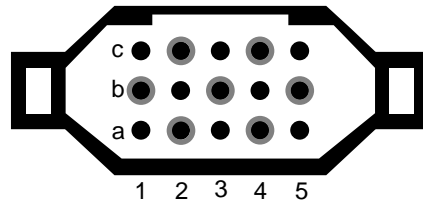


### Pin Assignment

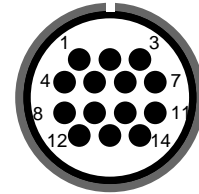
#### HAN 7 D



#### HAN 15 D



#### CPC14



connect.	function	HAN7D	HAN15D	CPC14
a	additional control output (live)	7	C3	12
b	control output power relay (live)	6	A3	14
c	control output power relays (neutral)	1	B3	13
d	protection earth *	≡	PE clamp	11
e	mains supply live	5	A1	8
f	mains supply neutral	2	B1	9
g	thermocouple +	3	B5	1
h	thermocouple - (type S, R)	4	C5	2
n	thermocouple - (type K, J)	4	A5	3

\* protection earth should be connected !

### Important Note

Please compare type of thermocouple used in the kiln with the controllers thermocouple input marked on the back of the controller. Mismatch can cause severe damage of kiln and contents