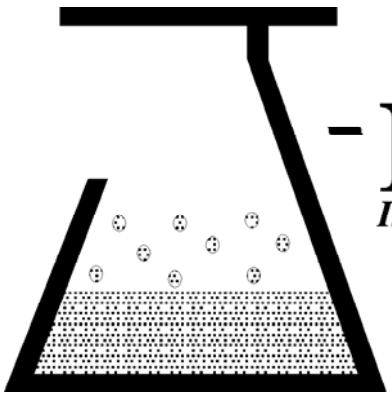
Temperature Control for Research and Industry

Multi-Temperature Zone Reaction Blocks



KEM Scientific, Inc.

Instruments for Science from Scientists

Index

You've purchased the most versatile controller available to the research community. We're confident it can regulate ANY heating/cooling situation you'll ever encounter. If the information in this manual isn't adequate to make your application work, call our Engineering Department for assistance.

Warranty

J-KEM Scientific, Inc. warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 12 months from date of purchase. If the unit should malfunction, it must be returned to the factory for evaluation. If the unit is found to be defective upon examination by J-KEM, it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive current, heat, moisture, vibration, corrosive materials, or misuse. This WARRANTY is VOID if devices other than the reaction block supplied with this unit are powered by the controller. Components which wear or are damaged by misuse are not warranted. This includes contact points, fuses and solid state relays.

THERE ARE NO WARRANTIES EXCEPT AS STATED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL J-KEM SCIENTIFIC, INC. BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES. THE BUYER'S SOLE REMEDY FOR ANY BREACH OF THIS AGREEMENT BY J-KEM SCIENTIFIC, INC. OR ANY BREACH OF ANY WARRANTY BY J-KEM SCIENTIFIC, INC. SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER TO J-KEM SCIENTIFIC, INC. FOR THE UNIT OR UNITS OF EQUIPMENT DIRECTLY AFFECTED BY SUCH BREACH.

J-KEM Scientific, Inc.
6970 Olive Boulevard
St. Louis, MO 63130
USA

Phone: (314) 863-5536
FAX: (314) 863-6070
Web site: http://www.jkem.com
E-Mail: jkem911@jkem.com

Safety Notices

Solvents and Vapors

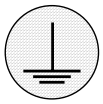
J-KEM's reaction block temperature controller should not be used in an environment containing flammable organic or gas vapors. It is recommended that the digital controller be placed outside of the research hood and the reaction block be placed inside of the hood.
CAUTION: This equipment should only be operated by qualified personnel knowledgeable in laboratory procedures.

Symbols

Power Switch: 1 - Mains power (120vac for USA and Canada) (230vac for Europe) is ON
0 - Mains power (120vac for USA and Canada) (230vac for Europe) is OFF


Caution. Risk of electric shock.


Caution. No user serviceable parts.


Protective conductor terminal. Earth Ground.

General Notice

WARNING: If equipment is not used as specified in this manual, the protection provided by this equipment may be impaired.

CAUTION: When operating this equipment insure that the reaction block is located away from flammable object.

Stability

The digital controller is equipped with a side mounting clamp. The controller should not be clamped to a free standing ring stand that can tip over. The controller should only be clamped to lattice networks securely attached to a bench or laboratory hood.

Power

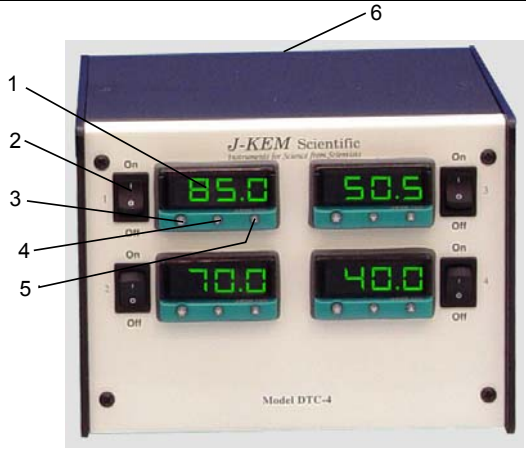
Voltage: 120-240 VAC @ 50-60Hz
Wattage: 1000 watts
Fusing (USA): 10 amp fast acting (F) 120 vac fuses
Fusing (Europe): 5 amp fast acting (F) 240 vac fuses

Environmental

Indoor use
Altitude up to 2000 meters
Operating temperatures of 5^{o} C to 40^{o} C
Maximum relative humidity of 80% for temperature up to 31^{o} C decreasing linearly to 50% relative humidity at 40^{o} C.
Installation category II

WARNING: This multi-position digital controller is designed for exclusive use with J-KEM Scientific's multi-position reaction blocks. Use of any other heater with the controller will void the warranty and create a significant safety hazard.

Controller Description for 2-, 4-, and 6-Position Reaction Blocks



4-Position Reaction Block Controller

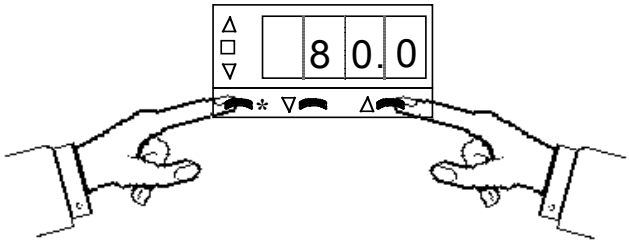
6-Position Reaction Block Controller

1. Temperature Display. Each reaction block position has a separate digital controller that regulates it heating and displays its temperature. The controller are numbered for the reaction block position they control. The digital meters shows the temperature of the process as the default display. It shows set point temperature (i.e. desired temperature) as a blinking number when '∗' button is held in.
2. Controller On/Off switch. Each digital meter has its own power switch, only the channels currently in use need to be turned on.
3. Control Key. When held in, the display shows the set point temperature for that channel. To decrease or increase the set point, press the '❒' key (4) or '⌘❑■' key (5), while simultaneously holding in the control key. The set point appears as a blinking number in the display.
4. Lowers set point when '∗' button (3) is simultaneously pressed.
5. Raises set point when '∗' button (3) is simultaneously pressed.
6. On the back of the controller is a round multi-pin receptacle. Connect the mating cord between the receptacle on the back of the controller to the receptacle on the reaction block.

Entering a Setpoint into the Controller

Each reaction block position is independent of the other positions in the system. Entering a temperature into the meter of any position has no effect on any other position in the system.

1. Turn power on to the digital temperature controller for the channel of interest. The default display (when no buttons are being pressed) of the controller is the current reaction block temperature.

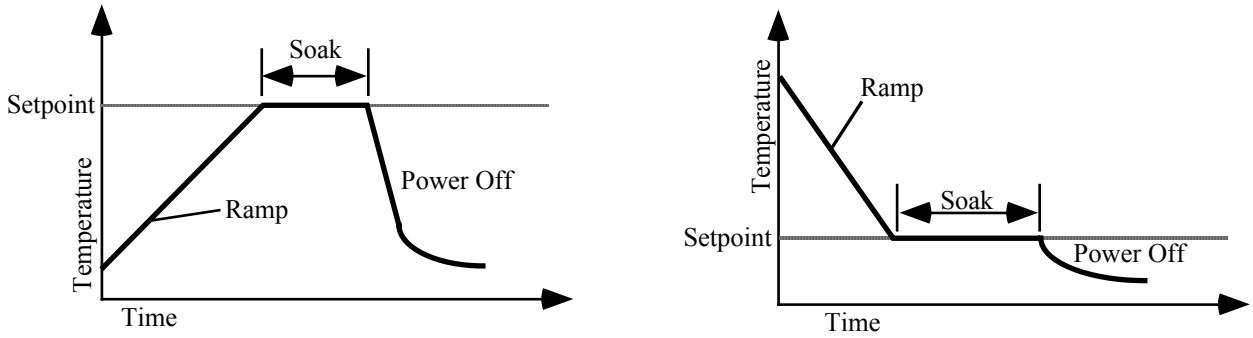


2. To see the current setpoint temperature (i.e., the desired temperature), press and hold in the '*' button on the front of the digital meter. The current setpoint appears as a blinking number in the display. To enter a new setpoint, hold in the '*' button on the front of the meter. While holding in the '*' button press either the ❒ button to increase, or the ⌘❑■ button to decrease the setpoint. When the desired temperature is present in the display, release all the buttons.

Using the Temperature Ramp Feature.

A new feature of J-KEM's controllers called 'Ramp-To-Setpoint' allows the user to enter a specific heating rate (e.g., heat to 120° C at a rate of 5° C/Hour), a second feature called 'Soak' then lets you specify how long to stay at that temperature before turning off.

Examples of Program Ramps



The controller is shipped with the Ramp-to-Setpoint feature OFF, the user must specifically turn Ramp-to-Setpoint ON. When Ramp-to-Setpoint is OFF, the controller heats to the entered setpoint at the fastest rate possible. When Ramp-to-Setpoint is ON, the controller heats (or cools) at the user entered ramp rate.
The Ramp-to-Setpoint feature and its associated parameters are turned on and set in the controller's programming mode. The Ramp-to-Setpoint features is unique to each individual digital meter. Turning this feature On or Off on any one meter has no affect on any other meter. The parameters of importance are:

SPrr **SetPoint Ramp Rate. Allowable Values: 0 to 9990 deg/Hr.**
This specifies the desired rate of heating (cooling) in the units of 'degrees per hour'.

SPrn **SetPoint Ramp Run. Allowable Values: ON, OFF, Hold**
This parameter turns the Ramp-to-Setpoint feature ON or OFF. During an active run, if 'SPrn' is set to 'Hold', the setpoint ramp stops and *holds* at its' current value. This continues until the parameter is set to ON or OFF. When set to OFF, the values in SetPoint Ramp Rate and Soak Time are ignored.

SoAK **Soak Time. Allowable Values: "- -", 0 to 1440 min.**
This specifies the amount of time to *soak* at the setpoint after the setpoint temperature ramp is complete. A setting of **"- -"** causes the controller to remain at the final setpoint indefinitely. A numeric value causes the controller to stay at the setpoint for the entered time and then turn power to the heater off after the time expires.

Important Points to Know

1. While the Ramp-to-Setpoint feature in on, the display alternates between the current reaction temperature and the word "SPr" to indicate that a "SetPoint Ramp" is active.

2. Setting a ramp rate doesn't guarantee that the reaction temperature actually ramps at the entered rate since heating rate is dependent on the power of the heater. For example, if a ramp rate of 1200 deg/Hr (i.e., 20 deg/min) is set, unless the heater is powerful enough to generate heat at such a high rate, the reaction temperature will not track the ramp temperature. Likewise, a reaction can't cool faster than natural cooling by ambient air.

3. Once the Ramp-to-Setpoint feature is activated in programming mode, it remains on until it's deactivated in programming mode.

Activating & Programming the Ramp-to-Setpoint Feature

1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word "tunE" appears in the display, then release both keys.
2.	Press the ↑ key (8 times) until the word "SPrr" appears in the display. This is were the ramp rate is set in units of degrees/hour. First hold in the '*' key, then while holding in the *' key press the ↓ or ↑ key until the desired ramp rate appears in the display, then let go of all the keys. Units are in degrees/hour.
3.	Press the ↑ key once and the word "SPrn" will appear in the display. This function turns the ramping feature ON, OFF, or to Hold. First hold in the '*' key, then while holding in the *' key press the ↓ or ↑ key until the desired setting appears in the display, then let go of all the keys.
4.	Press the ↑ key once and the word "SoaK" will appear in the display. Set the soak time in units of Minutes. A soak time of ' -- ' means to 'soak forever' (this setting is one below '0'). First hold in the '*' key, then while holding in the *' key press the ↓ or ↑ key until the desired time appears in the display, then let go of all the keys. If a soak time is set, the controller display alternates between the current reaction temperature and the word "StoP" when the soak time expires to indicate that power has been turned off.
5.	To exit programming mode, press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys.
6	Now enter the desired setpoint temperature. The controller will begin ramping to the new setpoint at the rate entered in Step 2. For example, if the current reaction temperature is 70 C and you enter a new setpoint of 120 C, then the controller begins to ramp from 70 to 120 C at the rate entered in Step 2. Likewise, if you entered a new setpoint of 30 C, the controller would begin cool from 70 to 30 at the rate entered in Step 2. As long as ramping is turned on (Step 3) the controller ramps from the current sensed temperature to any newly entered setpoint.

Deactivating the Ramp-to-Setpoint Feature

1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word "tunE" appears in the display, then release both keys.
2.	Press the ↑ key (9 times) until the word "SPrn" appears in the display. This function turns the ramping feature ON and OFF. First hold in the '*' key, then while holding in the *' key press the ↓ or ↑ key until OFF appears in the display, then let go of all the keys.
3.	To exit programming mode, press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys.

Multi-Position Reaction Blocks

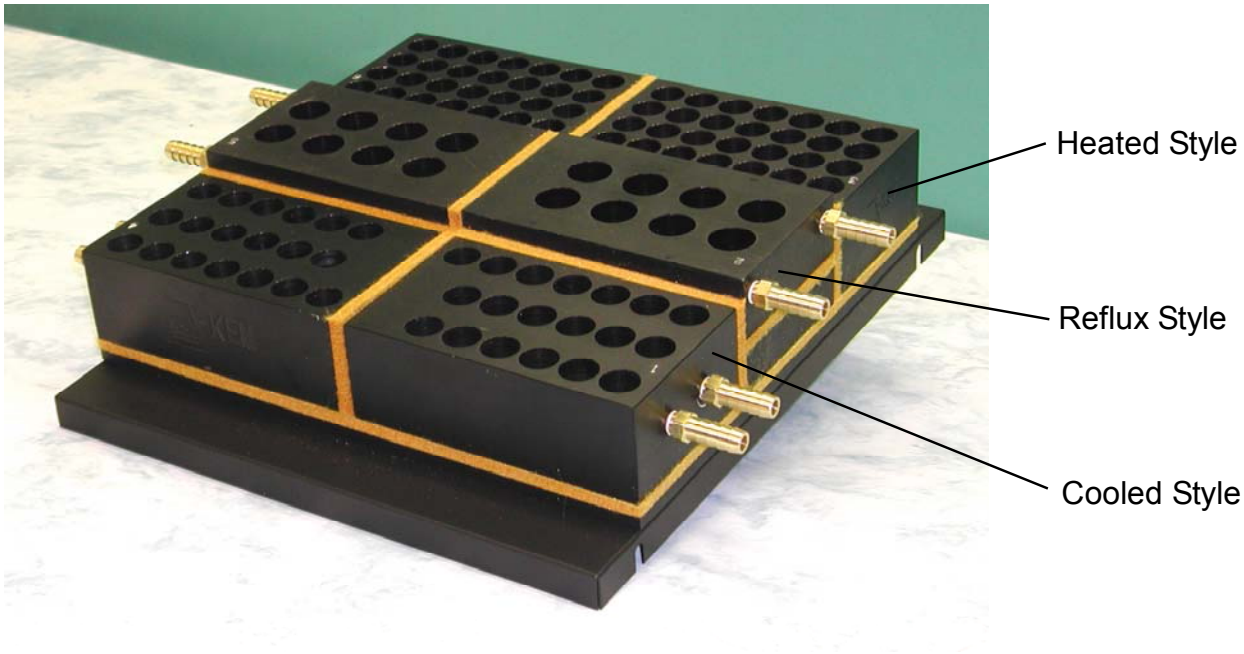
Connecting the multi-position temperature controller to the reaction block involves nothing more than connecting the gray power cord between the round connector on the controller and the mating round connector on the reaction block. Both the power and temperature sensor connections are made when the gray cord is attached. The temperature limit when using the internal electric heater is 130° C. Cooling fluids can be anything from liquid nitrogen to tap water.

The individual block positions of a multi-position reaction blocks can be made up of three different styles of reaction blocks.

Heated: This block style has a built-in electric heater. A heated only reaction block has no fluid connections.

Heated & Cooled: This block style has a built-in electric heater and an internally milled fluid flow path through which a cooled (or heated) heat transfer fluid can be circulated to control the block position. A cooled style block is a single aluminum block with an inlet and outlet fluid connection. When the temperature of a cooled style block is being controlled by an external circulating chiller, the digital temperature controller for that channel should be turned off so that it doesn't attempt to heat that position when the external chiller is cooling it.

Reflux: This block style consists of three block pieces secured together into a single unit. The bottom layer is heated and has a built-in electric heater, the top layer has two hose fittings connecting an internally milled path that cooling fluid is circulated through and the middle layer is a layer of insulation (gold material) that separates the heated bottom layer from the cooled top layer. A reflux block is designed to heat the fluid in the bottom half of the vial and condense it in the top half of the vial. When heating solvents to their boiling point, the vial should not be more than half full and the cap of the vial must be vented to prevent undue pressure build up that could cause the vial to explode.



Source of Vials for J-KEM's Reaction Blocks

To make using your Reaction Block quicker and easier, listed below are common vials that fit the various blocks. Except where noted, vials are from Alltech Associates (800) 255-8324.

Vials for Heated and Heated/Cooled Reaction Blocks	
Description	**Alltech Associates Catalog #. (800) 255-8324**
Vials for 2 ml Reaction Block	
12 x 32 mm vial with 10/425 thread. Volume of vial: 2ml	#98133 (15.00/pk of 100)
Septum hole caps with Teflon cap liner	#98705 (23.50/pk of 100)
Solid caps with Teflon cap liner	#98124 (13.20/pk of 100)
Vials for 4 ml Reaction Block	
15 x 45 mm vial with 13/425 thread. Volume of vial: 4ml	#98110 (15.50/pk of 100)
Septum hole caps with Teflon cap liner	#98735 (23.80/pk of 100)
Solid caps with Teflon cap liner	#98430 (14.50/pk of 100)
Vials for 8 ml Reaction Block	
17 x 60 mm vial with 15/425 thread. Volume of vial: 8ml	#988621 (66.00/pk of 200)
Solid cap with Teflon liner	#98430 (14.50/pk of 100)
Open hole caps for 8ml vials	#95261 (8.00/pk of 72)
TFE/Silicone liners for 8ml open hole caps	#98793 (19.00/pk of 100)
Caps and Liners for 20 ml Vials ****Vials below****	
Solid caps with silicone/Teflon liners	#99052 (22.50/pk of 100)
Open hole caps	#95331 (20.00/pk of 72)
TFE/Silicone liners for open hole caps	#95333 (45.00/pk of 72)

The 20 ml vials are from **Fisher Scientific** [(800) 766-7000] but any of the major supply houses will have the same vials. These are scintillation vials. Size: 28 x 61 mm. Cap thread: 22/400

Vials for 20 ml Reaction Block	Fisher Cat. # 03-337-5 (132.60/pk of 500)

Vials for Reflux Reaction Blocks	
Description	**Alltech Associates Catalog #. (800) 255-8324**
Vials for 2 ml Reflux Reaction Block	
15 x 45 mm vial with 13/425 thread. Volume of vial: **4**ml	#98110 (15.50/pk of 100)
Septum hole caps with Teflon cap liner	#98735 (23.80/pk of 100)
Solid caps with Teflon cap liner	#98430 (14.50/pk of 100)
Vials for 4 ml Reflux Reaction Block	
17 x 60 mm vial with 15/425 thread. Volume of vial: **8**ml	#988621 (66.00/pk of 200)
Open hole caps for vials	#95261 (8.00/pk of 72)
TFE/Silicone liners for open hole caps	#98793 (19.00/pk of 100)
Vials for 8 ml Reflux Reaction Block	
21 x 70 mm vial with 18/400 thread. Volume of vial: **16**ml	#988661 (80.00/pk of 200)
Solid cap with Teflon liner	#99050 (24.75/pk of 100)
Open hole caps for vials	#95281 (8.00/pk of 72)
TFE/Silicone liners for open hole caps	#95283 (27.00/pk of 72)
Vials for 20 ml Reflux Reaction Block	
28 x 95 mm vial with 24/400 thread. Volume of vial: **40**ml	#98912 (22.00/pk of 100)
Solid cap with Teflon liner	#99054 (27.35/pk of 100)
Open hole caps for vials	#95321 (16.00/pk of 72)
TFE/Silicone liners for open hole caps	#95323 (47.00/pk of 72)