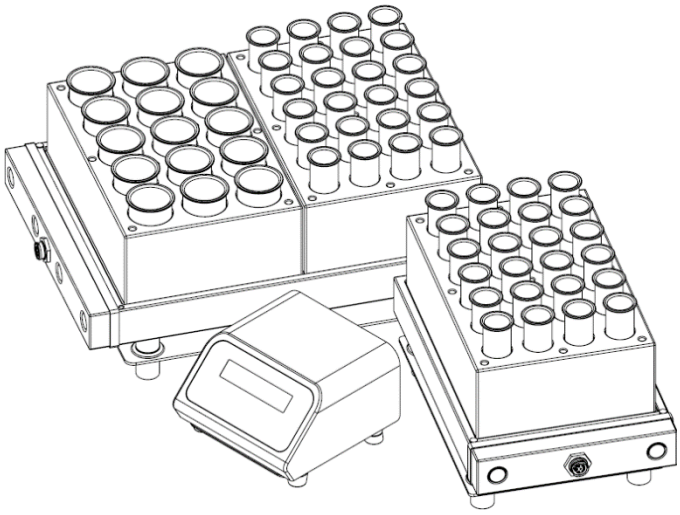
INSTRUCTION MANUAL

Graphite Hotplate

Model No.

Mars 320 / 430

Video List



ROCKER

Please read this instruction manual before using this product.

Important Notice

This instrument is designed for laboratory usage only. Please read this manual carefully before installing and operating. The instrument shall not be modified in any way. Any modification will void the warranty and may result in potential hazard. We are not responsible for any injury or damage caused by any non-intended purposes and modifying the instrument without authorization.

1. Check the voltage specified on the name plate and ensure it matches the line voltage in your location.
2. Install the instrument in a clean, dust-less and ventilated area under 40°C. Please keep the instrument away from flammable or explosive material.
3. Mars hotplate should be operated in a functional fume hood, whereas the controller must be placed outside the fume hood.
4. Mars hotplate is a high-temperature digestion system with exposed hot surface. Be careful around the instrument during or after operation and do NOT touch it to avoid serious burns.
5. Please cool the instrument to room temperature before changing blocks to avoid burns.
6. Hotplate and blocks are coated with PTFE, please do NOT contact the sharp objects to prevent from PTFE coating damage.
7. Do NOT bundle the cable and power cord to prevent any danger from overcurrent.
8. This product is not warranted and tested for using with perchloric acid. User should take full responsibility of use with perchloric acid.
9. This instrument must be grounded to prevent the risk of electrical short circuit. If there's any doubt about grounding installation, please consult a qualified electrician.
10. Please discard packing material according to local related regulations.
11. Operating condition

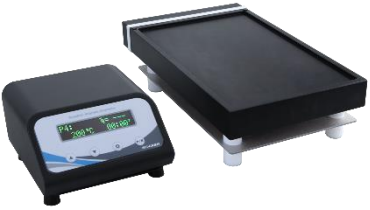
(a) Ambient temperature: 5~ 40°C
(b) Relative humidity: 80% RH Max.
(c) Power supply: 200-240V~, 50/60Hz
(d) Fuse of Mars 320: T6A, 250V~
Fuse of Mars 430: T10A, 250V~
(e) Altitude: up to 2000 m
(f) Pollution degree: II
(g) Overvoltages category: CAT II
(h) Indoor use

Caution: Hot surface

The equipment must be disconnected from the mains supply before replacing the fuse.

Unpacking

Please check if the package is complete without any damage before unpacking. When unpacking, please make sure you have all accessories that indicated on the list. If there is any problem, please keep the serial number along with packing case and contact your local distributor immediately for assistance.



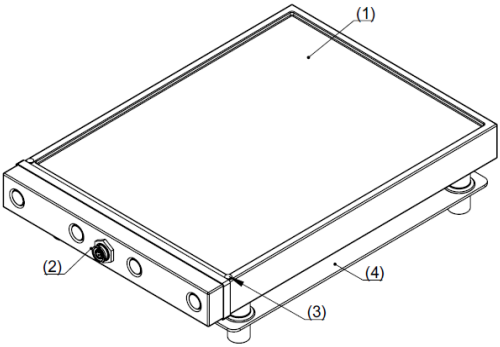
Mars 320

Mars 430

Item	Content	Item	Content
1	Graphite Hotplate	5	(Optional) External Temp. Sensor
2	Plug-in Heating Cable	6	(Optional) Graphite Block
3	Controller	7	(Optional) Digestion Tubes
4	Power Cord	8	Instruction Manual

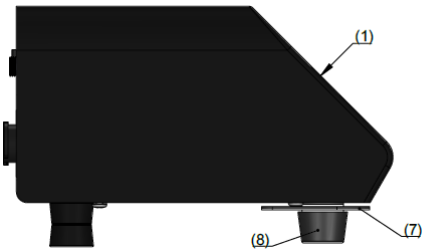
Main Part Diagram

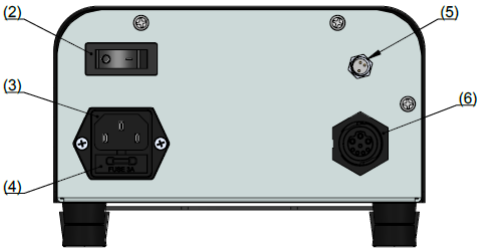
(1). Graphite Hotplate



Position	Designation	Position	Designation
1	Graphite Heating Surface	3	Hole for Reference Sensor
2	Socket of Heating Cable	4	Mica Thermal Protector

(2). Controller



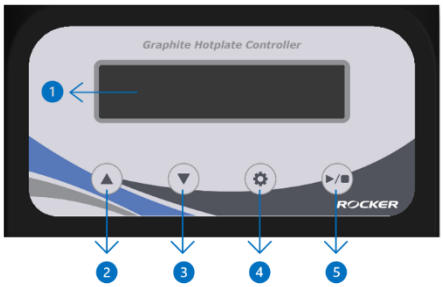


Position	Designation	Position	Designation
1	Display	5	Connector of External Temp. Sensor
2	Power Switch	6	Socket of Heating Cable
3	AC Socket	7	Wall-Mounted Accessory
4	Fuse Holder (with a Spare Fuse)	8	Foot Pads

Display / Button / Symbol Explication

(1). Operation Panel

Position	Designation
1	Display
2	Up Button
3	Down Button
4	Setting / Calibration Button
5	Start / Stop Button



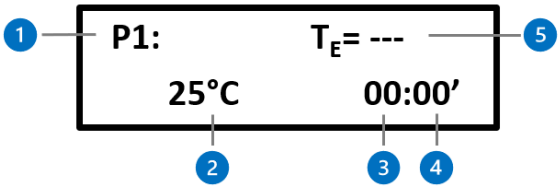
(2). Button

Button	Designation	Description
▲	Up Button	Select program or change setting value. (Hold the button to change value continuously)
▼	Down Button	Select program or change setting value. (Hold the button to change value continuously)
⚙	Setting / Calibration Button	1. User program setting (temperature and timer) 2. Temperature calibration.
⏵/■	Start / Stop Button	1. Start or stop heating. 2. Stop setting or calibration.

(3). Symbols

Symbol	Designation	Description
\ | / -	Timer / Counter Indication	Symbols alternate every 0.5 sec
_ . ↑	Heating Indication	Symbols alternate every 0.5 sec
¯ · ↓	Cooling Indication	Symbols alternate every 0.5 se
TE	Reading of External Temp. Sensor	If no sensor is connected, TE= ---

(4). Display



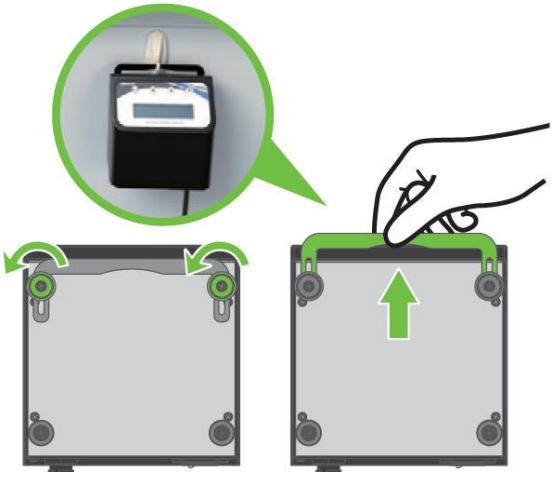
Position	Designation	Position	Designation
1	Program Name (P1~P4)	4	Timer (Minute)
2	Actual / Setting Temperature	5	Reading of External Temp. Sensor (If no sensor is connected, TE= ---)
3	Timer (Hour)		

Installation

(1). Instruction of Wall-Mounted Accessary

Loose the front foot pads of controller, pull out wall-mounted accessory then screw the front foot pads tightly. Hang Mars controller outside of fume hood to prevent corrosion.

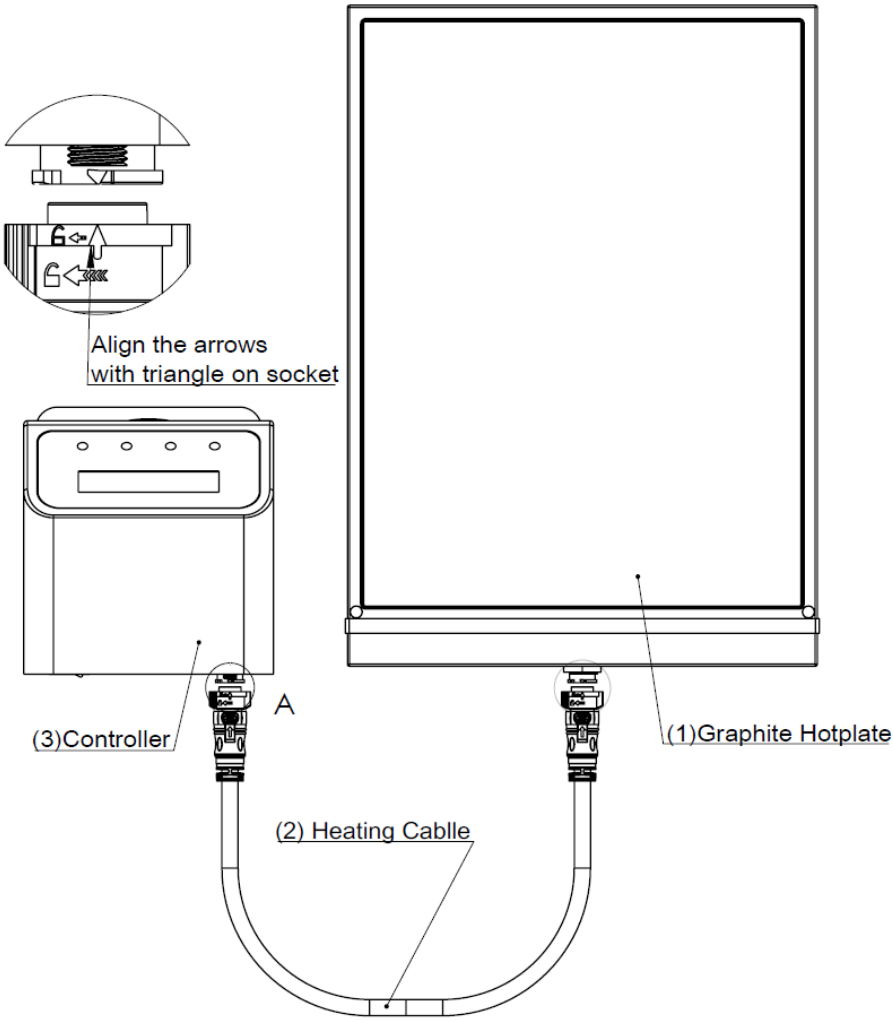
- Controller can be placed upright as well as hung outside of the fume hood.
- 3M 17004 adhesive hook is recommended.



(2). Instruction of Heating Cable Connection

Connect the hotplate and controller together by plug-in heating cable.

- Do NOT bundle the cable.
- Please align the arrows on both heating cable and socket and insert it.



Operation

(1). Program Menu

Item	Program	Description	Remark
Program List	P1	Preheating or continuous heating at 100°C	Both temperature and timer are adjustable.
	P2	Preheating or continuous heating at 120°C	Both temperature and timer are adjustable.
	P3	Preheating or continuous heating at 150°C	Both temperature and timer are adjustable.
	P4	Preheating or continuous heating at 200°C	Both temperature and timer are adjustable.
	CAL	Temperature calibration	Two-point temperature calibration.
	Rst	Reset to default calibration settings	
Parameter Setting	Temperature	0°C ~ 200°C	Operation temp. should be 5 °C higher than environment
	Timer / Counter	00:00 ~ 99:59	00:00 is continuous heating and counter always starts from 00:00 (HH:MM).
	Temperature Calibration	30°C ~ 200°C	Setpoint of high temp. (T2) should be at least 40 °C higher than low temp. (T1)

(2). Program Operation

(a). Continuous Heating Mode (Timer sets as 00:00)

Step	Operation	Display
1	Switch on the instrument and LOGO shows on the screen.	Graphite Plate
2	Program list shows on the screen in 2 seconds. (1)(2)	P1 : TE= - - - 100°C 10:00'
3	Select desired heating program by using ▲ or ▼. (4 programs are selectable.)	P4 : TE= - - - 200°C00:00'
4	Press ⏵/■ to start heating. (3)	P4 : TE= - - - 24°C↑00:00'
5	One beep indicates set temperature has been reached and the counter starts from 00:00.	P4 : TE= - - - 200°C00:01\
6	Press ⏵/■ to stop heating and back to program list after finishing experiment. (3) (4)	P4 : TE= - - - 200°C00:00'

Note 2. (a).

(1) Controller will memorize the selected program and maintain when it switches on next time.

(2) TE represents the reading of external temperature sensor and shows "---" if no sensor is connected.

(3) How to stop or select other programs:

Press ⏵/■ the screen shows "STOP HEATING?" message. Press ⚙ to stop heating and return to program list, press ⏵/■ to continue heating.

(4) 00:00 stands for continuous heating. The counter will stop until 99:59 ,whereas hotplate maintains heating continuously with heating indication, stop heating by pressing ⏵/■.

(b). Countdown Mode (Timer should not be set as 00:00)

Step	Operation	Display
1	Switch on the instrument and LOGO shows on the screen.	Graphite Plate
2	Program list shows on the screen in 2 seconds. (1)(2)	P4: TE= --- 100°C 10:00'
3	Select desired heating program by using ▲ or ▼. (4 programs are selectable.)	P4: TE= --- 200°C04:00'
4	Press ⏵/■ to start heating. (3)	P4: TE= --- 24°C↑04:00'
5	One beep indicates set temperature has been reached and the timer starts counting down.	P4: TE= --- 200°C04:00\
6	The 15-second beeps indicate program is complete, press any button to stop beeping. Press ⏵/■ back to program list.	P4: TE= --- 200°C00:00'

Note 2. (b).

(1) Controller will memorize the selected program and maintain when it switches on next time.

(2) TE represents the reading of external temperature sensor and shows "---" if no sensor is connected.

(3) How to stop or select other programs:

Press ⏵/■ the screen shows "STOP HEATING?" message. Press ✿ to stop heating and return to program list, press ⏵/■ to continue heating.

(3). Parameter Setting

Step	Operation	Display
1	Switch on the instrument, select desired program by using ▲ or ▼ and press ⚙ to enter parameter setting.(1)	P 2 : TE= - - - 1 2 0 ° C 1 0 : 0 0 ’
2	Heating Temperature Press ▲ or ▼ to modify the flash figure (temperature). Press ⚙ to move to other parameters. (2) (3)	P 2 : TE= - - - 1 8 0 ° C 1 0 : 0 0 ’
3	Heating Time (Hour) Press ▲ or ▼ to modify the flash figure (hour). Press ⚙ to move to other parameters. (2) (3)	P 2 : TE= - - - 1 8 0 ° C 0 4 : 0 0 ’
4	Heating Time (Minute) Press ▲ or ▼ to modify the flash figure (minute). Press ▶/■ to save the setting after setting is complete. (2) (3)	P 2 : TE= - - - 1 8 0 ° C 0 4 : 3 0 ’
5	Return to Program list after setting is finished. (4)	P 2 : TE= - - - 1 8 0 ° C 0 4 : 3 0 ’

Note 3.

(1) TE represents the reading of external temperature sensor and shows "---" if no sensor is connected.

(2) To stop parameter setting, press ▶/■ to save the modified parameters and return to program list.

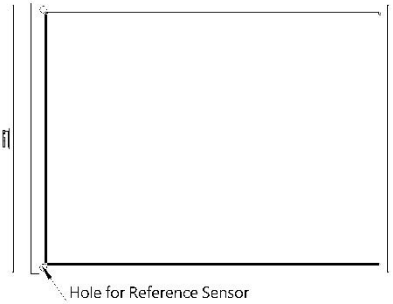
(3) Beep indicates the setting figure reaches the maximum or minimum.

(4) Setting parameters run in a continuous loop by pressing ⚙, press ▶/■ to finish the setting.

(4). Temperature Calibration

Insert electronic thermometer into hole for reference sensor. Calibrate temperature as following procedure.

- Please make sure thermometer and temp. setpoint is calibrated regularly or certified by standard organization to ensure the accuracy is ±1 °C.



Step	Operation	Display
1	Press ▲ or ▼ to select "CAL" program. Press ⚙ to start temperature calibration. (1)(2)	CAL: TE=--- T1=37°C T2=150°C
2	Calibration will be proceeded based on calibrated setpoint of T1 and T2 and screen shows heating state at the same time.(3)	T1: 37°C TE=--- 26°C Heating↑
3	A 30-min timer for stabilization shows up after set temperature has been reached.(4)	T1: 37°C TE=--- 37°C Wait29\
4	Press ▲ or ▼ to adjust temperature and match the reading of the thermometer.(5)	T1: 37°C TE=--- 36°C ADJ
5	Hold ⚙ for 1 second to store the parameter and start T2 calibration.	T2:150°C TE=--- 37°C Heating↑
6	A 30-min timer for stabilization shows up after set temperature has been reached.(4)	T2:150°C TE=--- 150°C Wait29\

7	Press ▲ or ▼ to adjust temperature and match the reading of the thermometer.(5) Hold ⚙ for 1 second to store the parameter and finish the calibration.(6)(7)	T2:150°C TE=--- 151°C ADJ

Note 4.

(1) Please set the calibrated setpoints before calibration, refer to (3) Parameter Setting.

(2) TE represents the reading of external temperature sensor and shows "---" if no sensor is connected. Press ⚙ to calibrate the reading of sensor when sensor is connected.

(3) If the actual temperature is higher than setting temperature, a cooling progress appears.

(4) To stop calibration, press ▶/■ and screen shows "STOP HEATING?" message. Press ⚙ to stop heating and return to program list, press ▶/■ to continue calibration.

(5) When connecting an external PTFE temperature sensor, press ⚙ to switch the calibration parameters of hotplate and external sensor. Press ▲ or ▼ to adjust the temperature while the figure is flashing, and hold ⚙ for 1 second to save the parameters and go for next step.

(6) Error message ("Cal-# Error") appears if calibration is error. (eg. T2 temperature is lower than T1). Press any button to reset to default calibration settings automatically.

(7) With an unsatisfied calibration result, you can re-calibrate or select the "Rst" program and press ▶/■ to reset to default calibration settings.

Maintenance

1. Please unplug the instrument and cool it down before cleaning.
2. Please operate the instrument in a well-ventilated area and keep it clean. If there's any solution drop or splash to hotplate, block, heating cable and controller, please clean the surface with damp cloth or mild soap after cooling to room temperature.
3. If fuse blows, please troubleshoot and solve problems first. When replace fuse on controller, get the spare fuse from the fuse holder by a flathead screwdriver.

Troubleshooting

Problem	Reason and Solution
Fail to start or Abnormal Display	• Loose plug → Reconnect plug to power supply. • Blown fuse → Replace a new fuse. • Instrument is over temperature → Cool the instrument down and operate in well-ventilated circumstance. • Display or components failure → Contact distributor for assistance.
Error Message - No Sensor	• No connection between hotplate and controller → Reconnect the heating cable to socket firmly.
Error Message - Cal-# Error	• Error of calibration or parameters → Press any button to reset to default calibration settings.
Error Message - System fault / Sensor fault	• Over temperature (> 210 °C) → Re-calibrate or contact distributor for assistance. • Fail to heat →Contact distributor for assistance. • Abnormal internal sensor → Contact distributor for assistance.
Error Message - Heater fault / Sensor fault	• Heating under turn-off state → Contact distributor for assistance. • Abnormal internal sensor → Contact distributor for assistance.
Other problems	• Please contact distributor for assistance.

Ordering Information

178320-22	Mars 320, Graphite Hotplate · AC220V, 50/60Hz
178430-22	Mars 430, Graphite Hotplate · AC220V, 50/60Hz
178200-45	PTFE-Coated Temperature Sensor (1.5M calbe)
178200-36	Rack for 50 mL Digestion Tube (for 1 Block)
178200-36-1	Rack for 100 mL Digestion Tube (for 1 Block)

- Digestion Tube

Material	Tube Volume					
	15 mL	Qty/pk	50 mL	Qty/pk	100 mL	Qty/pk
PP	178200-15-PP	1000	178200-50-PP	500	178200-100-PP	225
Borosilicate Glass	178200-15	60	178200-50	28	178200-100	18
PTFE	178200-15-PTFE	1	178200-50-PTFE	1	178200-100-PTFE	1

* Max. Operating Temperature •PP: 130°C •Glass, PTFE: 200°C

- Graphite Block (L x W): 295 x 197 mm

	Hole Diameter	Hole Depth	Max. Capacity	Applicable Tube
178200-07	16.5 mm	45 mm	70 well	φ16 mm tube
178200-08	20.5 mm	55 mm	54 well	φ20 mm tube
178200-09	25.5 mm	70 mm	40 well	φ25 mm tube
178200-10	19 mm	90 mm	54 well	15 mL digestion tube, φ18 mm tube
178200-11	31 mm	90 mm	24 well	50 mL digestion tube, φ30 mm tube
178200-12	47 mm	90 mm	15 well	100 mL digestion tube

178200-07 178200-08 178200-09 178200-10 178200-11 178200-12

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