

User Responsibility, Training, and Consequences of Misuse

OASIS prototyping facility, Protofab, operates as a shared research and prototyping facility. All users are expected to follow this SOP, facility policies, and applicable safety guidelines to ensure safe operation, equipment longevity, and equitable access for all users.

This SOP is not a substitute for hands-on training or tool qualification. Refer to User's Manual and Guides for details.

Users must complete required Protofab training and receive authorization prior to independent tool use. In the event of misuse, unintentional error, or non-compliance, corrective actions will be educational, proportional, and focused on preventing recurrence, taking into account the user's experience level and the nature of the issue.

Corrective actions may include:

- Clarification or coaching on proper tool use
- Additional training or temporary supervision
- Temporary suspension of independent tool access
- Restriction to supervised use until competency is re-established

Users may be held responsible for repair, cleaning, or downtime costs only in cases of negligence or repeated misuse.

1. Purpose

This Standard Operating Procedure (SOP) defines the safe and proper use of Yamato Forced Convection thermal chambers. This equipment provides temperature-controlled environment for baking (curing) material as well as overtemperature measurements and characterization.

2. Scope

This SOP applies to standard methods of material curing. Non-standard methods and material are outside the scope of this SOP and require prior approval from Protofab staff.

2. Safety & EHS

- **Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit.**
- PPE such as protective eyewear is mandatory except while using microscope eyepieces. Refer to facility rules for details.

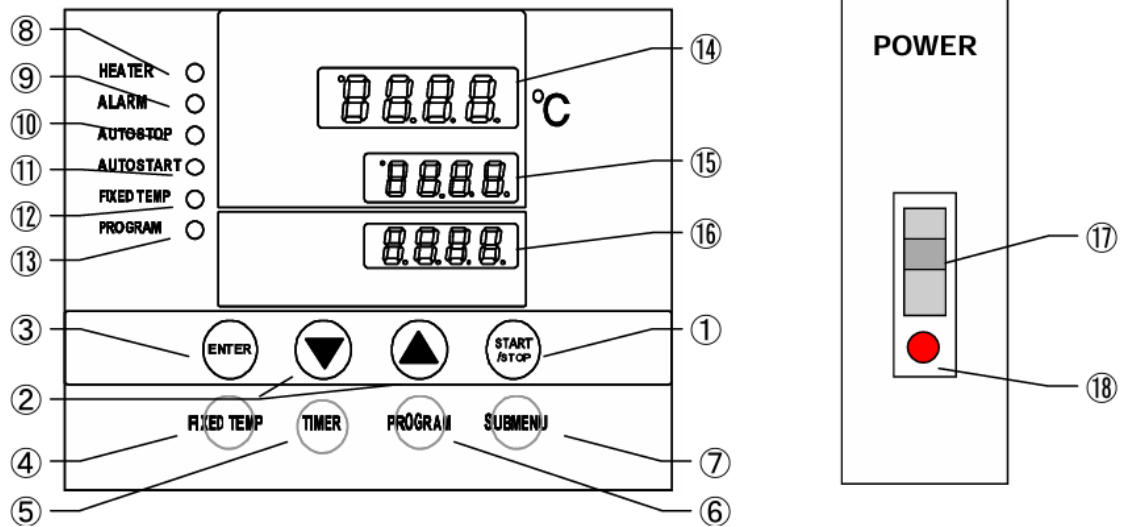


- The inside surfaces or the door may become hot during and just after operation which may cause burns. Use oven mitts to transfer material.
- Maximum load for each shelf is 33 Lbs. (15kg). Avoid heavier loads.

3. System Overview

Key features include:

- Temperature Control Range: Room Temp+5 to 260°C
- Temperature rise time: 60 min. (Room Temp to 210°C)
- Temperature fall time: /150 min. (210 to 50°C)
- Control Panel:



①	START/STOP Key :	Starts/stops the operation.
②	▲▼ Key :	Uses for rising UP/lowering DOWN the setting value.
③	ENTER Key :	Settles the inputted value.
④	FIXED TEMP Key :	Chooses the fixed temperature operation.
⑤	TIMER Key :	Chooses the timer operation (Quick Auto Stop/Auto Stop/Auto Start).
⑥	PROGRAM Key :	Chooses the program operation or program creation mode.
⑦	SUBMENU Key :	Uses for setting the overheating prevention temperature, calibration offset temperature, key lock function, or program repeat function.
⑧	HEATER Lamp :	Lights while the heater works.
⑨	ALARM Lamp :	Lights up when an error occurs. (Buzzer sounds simultaneously.)
⑩	AUTO STOP Lamp :	Blinks while setting quick auto stop timer or auto stop timer. Lights while quick auto stop timer or auto stop timer is running.
⑪	AUTO START Lamp :	Blinks while setting auto start timer. Lights while auto start timer is running.
⑫	FIXED TEMP Lamp :	Blinks while setting fixed temperature operation. Lights while fixed temperature operation is running.
⑬	PROGRAM Lamp :	Blinks while setting program operation. Lights while program operation is running.
⑭	Measurement Temperature Display :	Displays the measured temperature, setting character, alarm information.
⑮	Setting Temperature Display :	Displays the setting temperature, setting value for timer mode, remaining time.
⑯	Overheating Prevention Temperature Display :	Displays the setting temperature for overheating prevention device.
⑰	Power Switch : (Earth leakage breaker)	Turns ON/OFF the main power.
⑱	Electric leak testing button :	Checks the breaker's condition.

4. Application

- Thermoset material processing (e.g., epoxies for die attach or EIC/PIC underfill)
- Moisture removal Drying
- High Temperature Storage Reliability Test
- Burn-In Test

5. Pre-use checks (before every run)









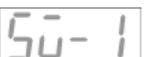

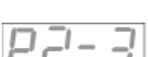




- Verify that samples do not contain explosive, flammable, or corrosive substances (e.g., strong acids, alkaline solvents, or halogenated oils).
- Check that no samples are placed directly on the internal base (current plate); all items must be on a shelf to prevent overheating or fire.
- Ensure the door can close fully and that the silicon packing is clean and intact.
- Overheating Prevention: Confirm the Overheating Prevention Device is set to a proper value (typically 10°C or more above the target operating temperature).

6. Standard operating procedure

6.1 Startup

- a) Turn on the Power: Flip the main power switch (earth leakage breaker) to the ON position.
- b) Wait for Initial Display: The screen will display default values and software version for approximately four seconds before showing the initial setting screen.
- c) Verify Safety Settings: Check that the current furnace temperature, operation mode character, and the overheating prevention device setting are displayed.

The characters controller shows and their purpose are as below:

Character	Identifier	Name	Purpose
	FiX	Fixed Temperature Setting Mode	Used for starting the fixed temperature operation.
	Sv	Temperature Setting	Used for setting the temperature.
	AStP	Timer Setting Mode Display	Represents the setting of quick auto stop or auto stop operation.
	AStr	Timer Setting Mode Display	Represents the setting of auto start operation.
	tim	Time Setting	Used for setting the time.
	PrG3	Program Type	Used for choosing program type from 1 to 3. (Refer to Page 24 " Program Operation".)
	PAt	Program Pattern	Used for choosing program pattern. (Refer to Page 24 " Program Operation".)
	End	Time Up	Displays when the timer operation is completed or while inputting number of program steps. (Refer to Page 24 " Program Operation".)
	Sv-1	Program Temperature Setting	Used for setting the temperature for each step in the program. (Sv-1 to Sv-30 is shown.)
	t-1	Program Time Setting	Used for setting the time for each step in the program. (t-1 to t-30 is shown.)
	PS-3	Step Number to be Repeated	Used for choosing the step number to be repeated under the program operation with repeat function. (Refer to Page 28 " Use program repeat function".)
	Pc-2	Repeating Times	Used for setting the repeating times under the program operation with repeat function. (Refer to Page 28 " Use program repeat function".)
	cAL	Calibration Offset Setting	Used for inputting the calibration offset temperature. (Refer to Page 31 "Other Function".)
	oH	Overheating Prevention Setting	Used for setting temperature for overheating prevention device. (Refer to Page 17 "Setting of Overheating Prevention Device".)
	Lock	Key Lock	Locks the keys on control panel to protect from unnecessary operation. (Refer to Page 31 "Other Function".)

6.2 Operating Modes and Function

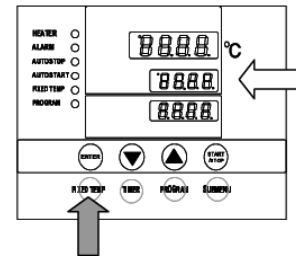
- **Fixed Temperature Mode:** The standard mode where the oven maintains a single, constant set temperature until manually stopped.
 - Pressing the FIXED TEMP key enters into the fixed temperature operation setting mode.
 - Pressing it again enters into the temperature setting mode.
 - The "▲▼" are used to set temperature.
 - Pressing the START/STOP key starts or stops operation.
- **(M) Quick Auto Stop Mode:** Used to set a countdown timer while the unit is already running in Fixed Temperature mode; the oven automatically stops when the timer reaches zero.
 - The period up to operation stop can be set by pressing the TIMER key during fixed temperature operation.
 - The "▲▼" are used to set the time.
 - Pressing the START key starts the quick auto stop operation, activates the timer function and stops the operation automatically after specified period.
- **Auto Stop Mode:** A preset mode where you define both the target temperature and a specific duration. The timer begins only once the furnace reaches the set temperature, after which it automatically shuts off.
 - Pressing the TIMER key displays "AS t p".
 - The setting temperature "SV" can be set by pressing the ENTER key.
 - The operation time "tim" can be set by pressing it again.
 - Pressing the START/STOP key starts the auto stop operation.
- **Auto Start Mode:** A delay timer mode that specifies a period to wait before the oven automatically begins heating to a preset temperature.
 - Pressing the TIMER key displays "AS t r".
 - The setting temperature "SV" can be set by pressing the ENTER key.
 - The operation time "tim" can be set by pressing it again.
 - Pressing the START/STOP key starts the auto start operation.
- **Programmed Profile Mode:** A sophisticated mode allowing you to create complex temperature profiles. You can program up to 30 individual steps (depending on the chosen program pattern) to change temperatures over specific time intervals, including a repeat function.
 - Pressing the PROGRAM key displays "PrG1".
 - Press it again to select the program mode.
 - Press the ENTER key to select the pattern "PA t". Press the ENTER key to display "End".
 - Input the number of patterns to be used.
 - Input the temperature and time of patterns "SV-n" and "t-n" respectively.
- **Overheating prevention function:** This function is set to be automatically activated (auto reset) when the temperature exceeds the setting temperature. The unit stops operation when the device is activated. The unit starts operation again when the POWER switch is pressed again (manual reset).

- **Recovery at power failure:** The unit starts operation with the same condition as just before power failure if it occurs during operation. Press the START/STOP key to start the unit again.

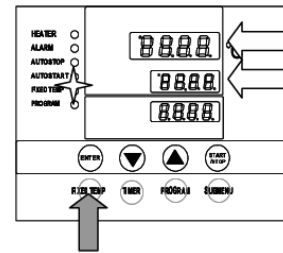
6.4 Standard Operations

6.4.1 Fixed Temperature Operation Procedure

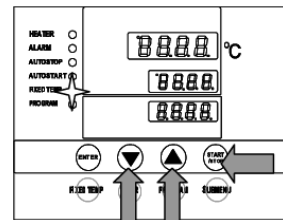
- Press the FIXED TEMP key to display "FIX", indicates the fixed temperature operation, on the center display.



- Press the FIXED TEMP key again.
- The setting temperature screen displays the character "SV" which indicates the temperature setting. Also, it displays the current setting temperature blinking. The FIXED TEMP lamp blinks, too.
- Set the temperature by pressing the "▼▲".



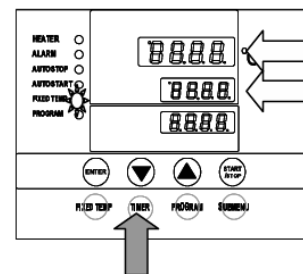
- Start:** Press the orange START/STOP key for about one second. The unit starts operation and the blinking FIXED TEMP lamp lights on.
- Stop:** Press the orange START/STOP key for about one second. The unit stops operation and the FIXED TEMP lamp lights off. The screen returns to the initial setting screen.



Note: To correct or check setting, Press the FIXED TEMP key again to correct or check the setting. Changing the setting temperature during operation is also possible by pressing the FIXED TEMP key.

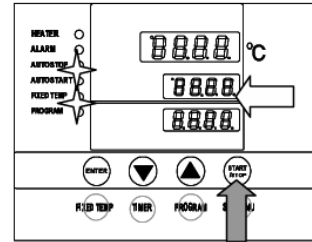
6.4.2 Quick Auto Stop Operation Procedure

- Check that the FIXED TEMP lamp lights on and that the unit is under operation.
- Press the TIMER key.
- The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.
- Select the time by pressing the "▼▲".

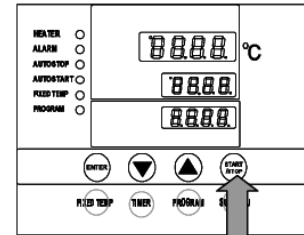


Note: The maximum setting time is "999hours and 50 minutes ". The time can be set in increments of a minute under 99 hours and 59 minutes. It can be set in increment of ten minutes over 100 hours. The "▼▲" can change the setting time quickly when it is pressed continuously. Press them discontinuously when fine adjustment is needed.

- e) Press the START/STOP key for one second after deciding the time.
- f) Timer operation starts with the FIXED TEMP and AUTO STOP lamps lighting on.
- g) The timer is activated at the point when the START/STOP key is pressed.
- h) The operation stops automatically at setting time.



- i) Buzzer continues to sound for about five minutes at operation stop.
- j) The setting temperature screen displays the character "End", which indicates termination of operation, with the FIXED TEMP and AUTO STOP lamps lighting on. Press the START/STOP key to terminate the timer operation mode. The screen returns to the initial setting screen.



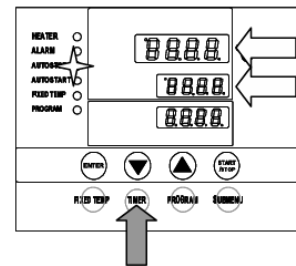
Note: Changing the setting temperature during operation is possible by pressing the FIXED TEMP key. Press the ENTER key after changing the setting.

Changing the setting temperature during operation is available by pressing the FIXED TEMP key. Press the ENTER key after changing the setting.

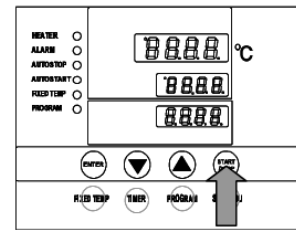
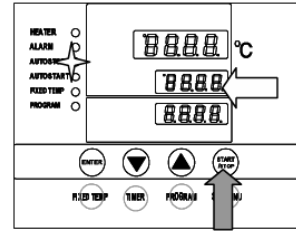
Press the ▼ key to display the setting temperature, operation mode and residual time on the setting temperature screen.

6.4.3 Auto Stop Operation Procedure

- a) Press the TIMER key on the initial screen. Press the TIMER key again. The setting temperature display screen displays the character "AstP", which indicates the auto stop operation, with blinking.
- b) Press the ENTER key. The measurement temperature screen displays the character "SV", which indicates the temperature setting. The setting temperature screen displays the current setting temperature with blinking. The AUTO STOP lamp blinks, too.
- c) Set the temperature using the "▼▲".
- d) Press the ENTER key again. The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.
- e) Set the time using the "▼▲".



- f) Press the START/STOP key for one second after deciding the time.
- g) Timer operation starts with the AUTO STOP lamp lighting on.
- h) The timer is activated at the point when the temperature in furnace (measurement temperature) reaches to the setting temperature.
- i) The operation stops automatically at setting time.
- j) Buzzer continues to sound for about five minutes at operation stop.
- k) The setting temperature screen displays the character "End", which indicates termination of operation, with the FIXED TEMP and AUTO STOP lamps lighting on. Press the START/STOP key to terminate the timer operation mode. The screen returns to the initial setting screen.

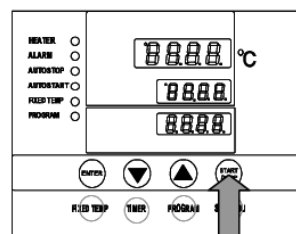
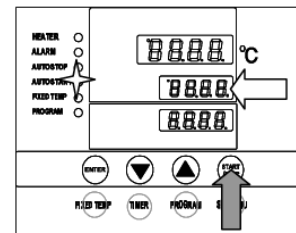
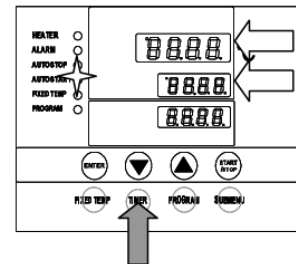


To correct or check setting: Changing the setting temperature or time during operation is possible by pressing the TIMER key. Use the "▼▲" to change the setting value.

Press the ENTER key respectively after changing the setting. Press the "▼" to display the setting temperature, operation mode and residual time on the setting temperature screen.

6.4.4 Auto Start Operation Procedure

- a) Press the TIMER key on the initial screen. Press the TIMER key again. The setting temperature display screen displays the character "Astr", which indicates the auto start operation, with blinking.
- b) Press the ENTER key. The measurement temperature screen displays the character "SV", which indicates the temperature setting. The setting temperature screen displays the current setting temperature with blinking. The AUTO START lamp blinks, too.
- c) Set the temperature using the "▼▲".
- d) Press the ENTER key again. The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.
- e) Set the time using the "▼▲".
- f) Press the START/STOP key for one second or so.
- g) Timer operation starts with the AUTO START lamp on.
- h) The operation starts automatically at setting time.
- i) Press the START/STOP key for one second to stop or terminate operation. The screen returns to the initial setting screen.



To correct or check setting: Changing the setting temperature or time during operation is possible by pressing the TIMER key. Use the "▼▲" to change the setting value. Press the ENTER key respectively after changing the setting. They are not changeable after the unit starts operation. In this case, stop the operation by pressing the START/STOP key, then set the value again.

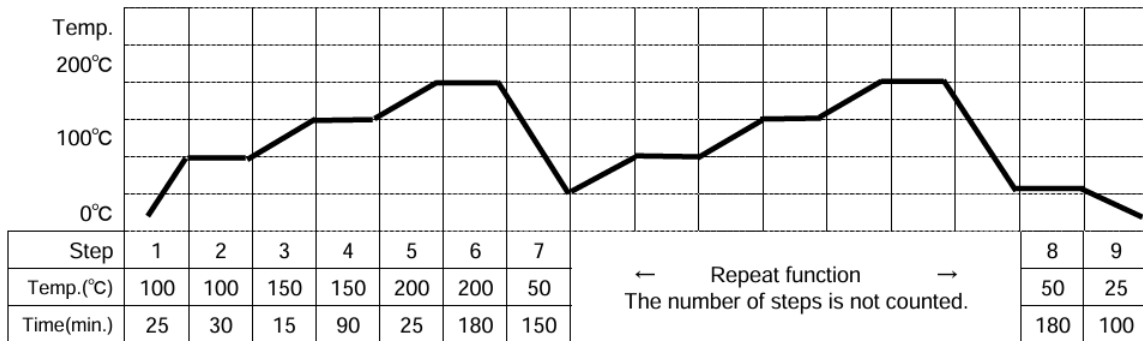
Press the "▼" to display the setting temperature, operation mode and residual time on the setting temperature screen.

6.4.5 Program Operation Procedure

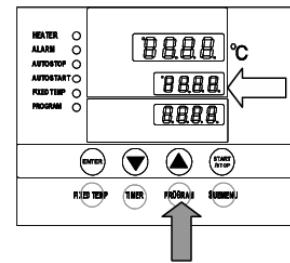
Program types:

- PrG1 (-): 1 program pattern using 30 steps maximum can be created.
- PrG2 (PA t1 & PA t2): 2 program patterns using 15 steps maximum can be created.
- PrG3 (PA t1, PA t2 & PA t3): 3 program patterns using 10 steps maximum can be created.

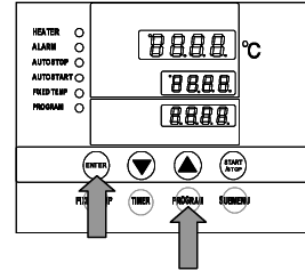
Instructions are based on the example below:



- Press the PROGRAM key once. The measurement temperature display screen displays the previous program mode. Press the PROGRAM key again to display the next program mode.
- Select the mode and press the ENTER key. When PrG1 is selected, the measurement temperature display screen displays "End". When PrG2 is selected, the measurement temperature display screen displays the program pattern "PA t1". For the pattern of PrG2, select "1" or "2" using the "▲▼". Press the ENTER key again. The measurement temperature display screen displays "End". When PrG3 is selected, the measurement temperature display screen displays "PA t1". For the pattern of PrG3, select "1", "2" or "3" using the "▲▼". Press the ENTER key again. The measurement temperature display screen displays "End".
- Select PrG3 referring to 3 mentioned above.
- Input the number of steps, temperature and time for respective steps using the program creation sheet.
- Press the ENTER key. The PA t 1 is displayed with blinking. ("End" is displayed if PrG1 is selected. In this case, skip next two steps).
- Select the unused pattern from among Pat1, Pat2 and Pat3 using the "▲▼".



- g) Press the ENTER key. "End" is displayed and the step number is also displayed with blinking. "End" is a character which indicates the total step number to be used. "9" will be input here.
- h) INPUT "9", which is the total step number to be used here, using the "▲ ▼".
- i) Press the ENTER key. The character "SV-1", which indicates the setting temperature of the first step, is displayed. The current setting temperature is also displayed with blinking.
- j) Set the temperature of the first step using the "▲ ▼". "100" is input here to set the temperature to 100°C.
- k) Press the ENTER key. The character "t-1", which indicates the setting time of the first step, is displayed. The current setting time is also displayed with blinking. Before setting the time, check the temperature rise/fall capability of unit. For example, about 90 minutes is needed to increase the temperature from room temperature to 260°C for DKN602 type (60minutes for DKN812 type). When the current temperature is supposed to be 25°C, it takes about 3 minutes to increase the temperature by 1°C, accordingly takes about 90 minute until it reaches to 260°C. Add an extra considering the temperature stability time. The setting time of timer in respective steps is 999 hours and 50 minutes maximum.
- l) After the time is set, press the ENTER key.
- m) The character "SV-2", which indicates the setting temperature of the second step, is displayed. In the same way, input the temperature and time for respective steps using the program creation sheet. The different method is necessary where program repeat function is used. In this case, press the SUBMENU key after setting the time (t-7 in the example) in the step where the repeat operation is to be used (Step 7 in the example). This enters the repeat function setting mode. Follow the "Use program repeat function" in page 28 for the input method of program repeating function.
- n) The screen returns to the initial setting screen after the setting of temperature and time in the final step is completed.



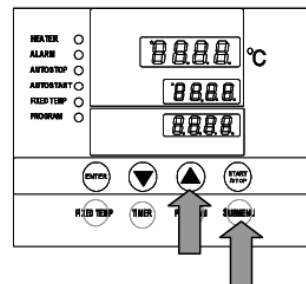
Start Program: Press the START/STOP key for about one second. The program operation previously set starts. The PROGRAM lamp lights on and the setting temperature screen displays the step currently under operation. Press the "▼" to check the setting temperature and residual time of step currently under operation on the setting temperature screen.

End Program: Buzzer continues to sound for about five minutes at operation stop. The measurement temperature screen displays the character "END", which indicates the termination of program. Press the START/STOP key to return to the initial screen.

To correct or check setting: Press the FIXED TEMP key to correct the created program or to check the setting value. The screen returns to the former one, where correction or check is possible. Last screen is displayed when the FIXED TEMP key is once pressed. Note: Correction or check should be made on the program setting screen.

Use program repeat function: This section explains the registration procedure of program using repeat function in "4. Register program" above. The procedure sets the step number to be repeated "PS-n" and repeat times "Pc-n"(n: step number).

a) Press the SUBMENU key in stead of the ENTER key after setting the time (t-7 in the example) in the step where the repeat operation is to be used (Step 7 in the example). This enters to the repeat function setting mode.



b) The measurement temperature screen displays the character "PS-n", which indicates the step to be repeated in the program pattern. The measurement temperature screen indicates "PS-7" in the example because repeat function is used at the seventh step. The step number 1 to 7 can be input in the setting temperature display screen. Enter the number (1 in the example) using the "▲▼".

c) Press the SUBMENU key. The measurement temperature screen displays the character "Pc-n", which indicates the repeating times. Enter the value of repeating times (2 in the example) with "▲▼".

d) The screen goes to that for the next step when the SUBMENU key is pressed again. The screen to input the Sv-8 is displayed next in the example.

To correct or check setting: Correction of setting during the repeat setting mode is impossible. To correct or check the setting, end the setting of step currently input. Press the FIXED TEMP key after the temperature setting screen for the next step appears. The screen returns to the former one and re-setting is possible.

To correct or check setting: Correction of setting during the repeat setting mode is impossible. To correct or check the setting, end the setting of step currently input. Press the FIXED TEMP key after the temperature setting screen for the next step appears. The screen returns to the former one and re-setting is possible.

6.5 Shutdown

Do not shut down the oven when done. Just stop the process and remove your samples when safe.

7. Process recipes / parameters

- Recipes (settings) can be found on ProtoWiki.
- Note that the recipes are baseline and may vary based on the BOM.

8. Change log

- Date / author / summary