

OPERATOR'S MANUAL

AUTOCLAVE
SM-22/32/52



yamato
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IMPORTANT

PLACE THE MESH STRAINER IN THE BOTTOM DRAIN PART
OF THE CANISTER.

NOTE:

STRAINER MUST BE INSTALLED BEFORE OPERATING.

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT:

YAMATO SERVICE DEPARTMENT
(800)292-6286 EXTENSION 235

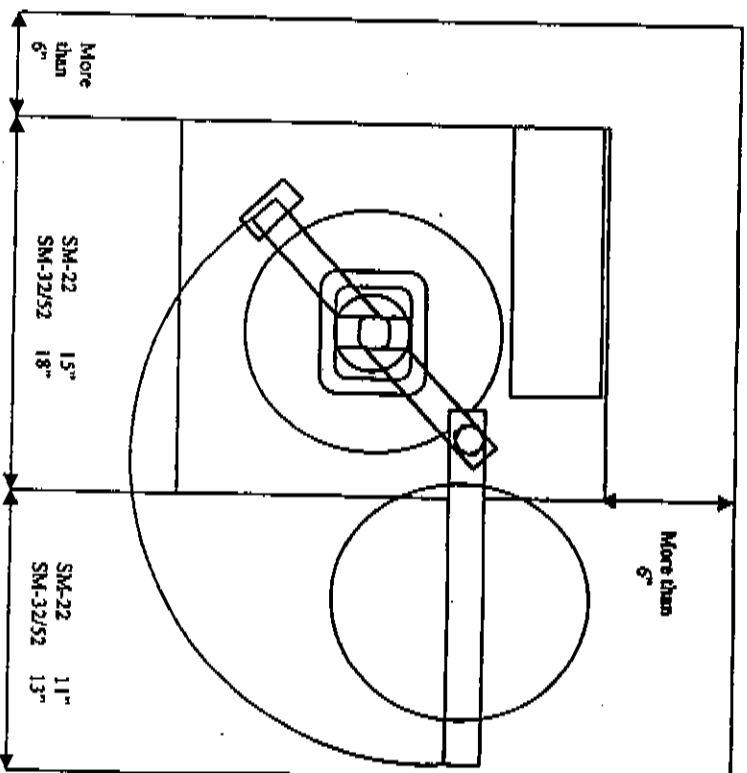


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1. INSTALLATION

1. Install autoclave with adequate clearance on all sides as follows:

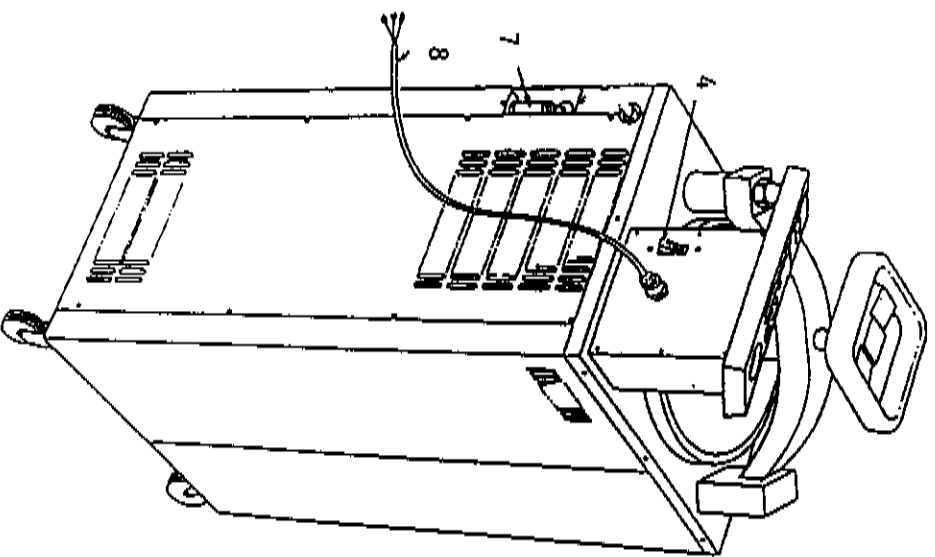
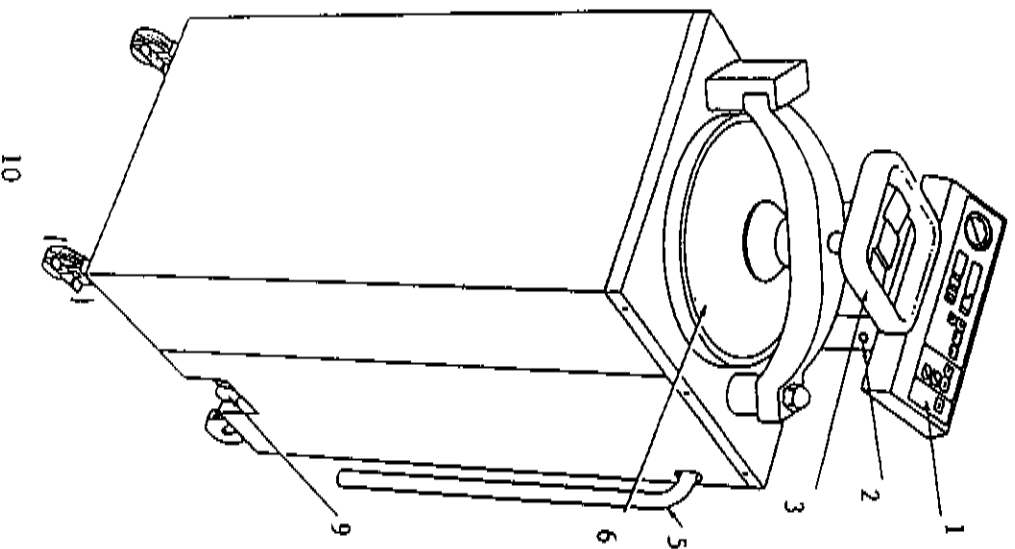


2. The autoclave has four casters. The two casters located in the front have stoppers. Make sure that the stoppers are in locked position.
3. DO NOT install the autoclave in the following environments:
 - Inflammable or corrosive gas
 - High humidity
 - Ambient temperatures above 95°F
 - Under direct sun

2. SPECIFICATIONS

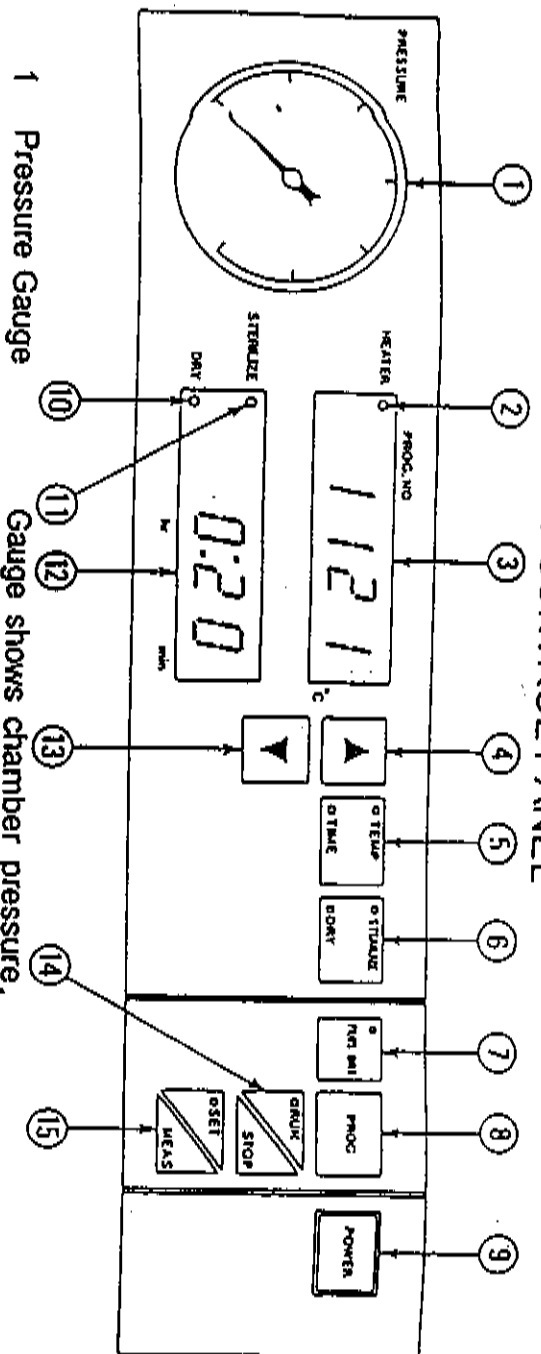
	SM-22	SM-32	SM-52
Temperature setting range	115°C-128°C 150°C-180°C		
Slow/quick sterilize Dry			
Slow/quick pressure release	Slow Release Quick Release Maximum Pressure	20 minutes (approx.) 1 minute (approx.) 22.8 psi	
Exterior	Cold rolled carbon steel sheets finished with baked melamine resin		
Interior	SST 304 stainless steel		
Temperature control	Microprocessor PID control, 3 programs, battery back-up memory		
Temperature sensor	Thermocouple		
Display	Digital set and readout for temperature and time		
Heater for sterilizer	1.5kW	1.8kW	2.0kW
Heater for dryer	1.0kW	1.5kW	1.5kW
Timer setting range	0 - 99 hrs. 59 min.		
Dual overheat prevention	Automatically set 12°C above set temperature		
Safety	Built-in audible/visible self-diagnostic functions (temperature sensor disconnect, triac short circuit, heater disconnect, low water level cut-off, excess pressure release valve, circuit breaker)		
Interior dimensions (diam. x ht. -- inches)	ø9.4 x 17.5	ø11.8 x 17.5	ø11.8 x 25.8
Exterior dimensions (W x D x H -- inches)	14.9 x 18.5 x 33.7	17.3 x 20.9 x 33.8	17.3 x 20.9 x 42.5
Capacity (cu. ft.)	0.8	1.2	1.8
Power supply	115VAC 14A	115VAC 17A	208VAC 11A
Shipping weight (lbs.)	-115	-143	-160
Accessories:			
Bottom plate	1 each		
Drain bottle	1 each		
Mesh strainer	1 each		
Drain hose	1 each		

3. EXTERNAL VIEW



- | | | | |
|---|-------------------------|----|----------------------------|
| 1 | Control Panel | 6 | Lid |
| 2 | Pressure Release Switch | 7 | Excessive Pressure Release |
| 3 | Handle | 8 | Power Cord |
| 4 | Circuit Breaker | 9 | Drain Cap |
| 5 | Drain Hose | 10 | Lock Release |

4. CONTROL PANEL



- 2 Heater Indicator
Light comes on indicating heater is ON.
- 3 Temperature Display
Displays set temperature, measured temperature, program bank number and error codes.
- 4/13 Setting Key
Changes number for temperature and time.
- 5 Display Changing Key
Changes display indication to temperature or time.
- 6 Display Changing Key
Changes display indication (set/measured temperature and time) to sterilize to dry.
- 7 DRY Key
Press this key when drying is needed after sterilization.
- 8 Program Bank Key
Retrieves program. Up to three programs can be stored.
- 9 Power Switch
Controls power to all functions.
- 10 Dry Indicator Lamp
Light comes on when autoclave is in dry mode.
- 11 Sterilize Indicator Lamp
Light comes on when autoclave is in sterilize mode.
- 12 Time Display
Displays set time/measurement time.
- 14 RUN/STOP Key
Runs or stops the program.
- 15 SET/MEAS Key
Selects and displays setting or measurement temperature and time.

5. PRINCIPLES OF OPERATION FOR DRYING AND STERILIZATION

1. When the RUN/STOP key is pressed to start the program, the dryer heater attached on the outer surface of the canister goes ON and the interior of the canister is heated. This pre-heating system warms up the sterilizer to prevent condensation of vapor when it comes in contact with the canister wall. This system reduces the drying operation time.
2. After the interior of the canister is heated, the dryer heater goes OFF and the sterilizer heater at the bottom of the canister goes ON. This heater produces steam to displace the air in the canister. The air is discharged through the deaeration pipe into the drain bottle via the outlet at the bottom of the canister. When the air displacement is finished, steam is continuously exhausted until the interior temperature reaches the boiling point. At this point, the deaeration is completed and the steam exhaust solenoid valve closes. The canister is now tightly closed. The interior temperature and the pressure start increasing.
3. When the sterilizer temperature and pressure reach the set values (e.g., 121°C, 1.0 kg/cm²), the timer starts sterilization.
4. When the time is UP, an alarm sounds to indicate the completion of sterilization. The drainage solenoid valve opens to discharge hot water. The steam exhaust solenoid valve also opens to remove the remaining steam.
5. When the exhaustion of the remaining steam is finished, the steam exhaustion solenoid valve and the drainage solenoid valve close. The dryer solenoid valve opens and the dryer heater goes ON. When the interior temperature reaches the set value (e.g., 170°C, 30 min.), the timer starts the drying process.
6. During the drying process, the interior temperature is kept at the set value and the moisture is exhausted through the dryer solenoid valve. When the time is UP, the alarm sounds to indicate the completion of the whole process.

For Sterilization Only:

7. When the program is started by pressing the RUN/STOP key, the sterilizer heater goes ON. In this case, the pre-heating process is bypassed.

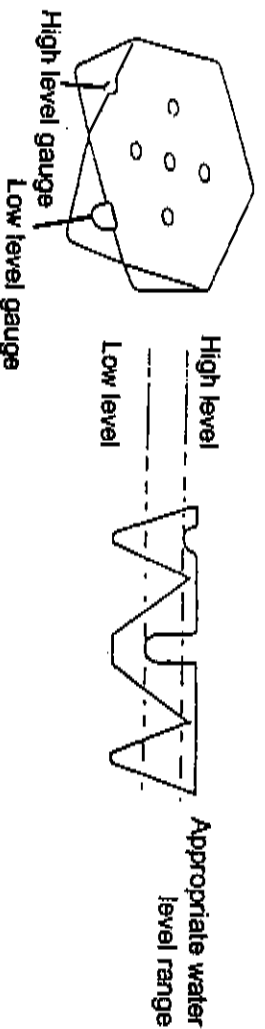
8. When the temperature reaches the set value, the timer starts and sterilization begins. The alarm sounds when the time is UP to indicate the completion of sterilization.
9. When sterilization is complete (e.g., 121°C, 1.0 kg/cm²), the interior pressure gradually decreases as the canister interior cools. When the interior reaches atmospheric pressure, the steam exhaust solenoid valve opens and the alarm sounds to indicate the completion of the whole process. It takes approximately 20 minutes to go back to atmospheric pressure (Slow Pressure Release).
10. The interior pressure can be quickly reduced by pressing the RUN/STOP key to open the steam exhaust solenoid valve. (Quick Pressure Release--It takes approximately one minute to go back to atmospheric pressure.) In this case, care should be taken not to scatter the samples. The steam exhaust solenoid valve can be opened also by pressing the pressure release switch. (See page 3, External View.) This switch is independent of the RUN/STOP key and therefore the program is not disrupted even when it is depressed.

6. OPERATION PREPARATION

1. Place the bottom plate and the mesh strainer in the canister and insert the drain hose in the drain outlet and the polyvinyl bottle. Use the bottle included in the package or a container larger than five (5) liters.
(CAUTION: If you see steam, hose is very hot.)

2. Add distilled water (DO NOT use dionized water) up to the high level mark of the drain plate (see the diagram). Make certain that the water level is always between the high and low level marks.

BOTTOM PLATE



3. Place the samples in separate baskets and stack them if necessary. Baskets with adjustable shelves are the most efficient as the positions of shelves can be arranged according to the sizes of the samples. When baskets are not used, be careful not to obstruct the exhaust outlet with samples, especially paper or cloth.
4. Close the upper lid and turn the handle slowly. Do not overtighten.
5. Turn the circuit breaker "ON" located on the back of the operation panel.

Operation Procedure for Drying and Sterilization

1. Switch on (press) the POWER key.
2. Switch on (press) the DRY key.
3. Set up the program for temperature and time. Refer to page 9, "Temperature Control Operation Method".
4. Press the RUN/STOP key to start the program.
5. To view the set temperature and time, press the SET/MEAS key.

6. The alarm sounds to indicate the end of sterilization and drying operation.

7. Press RUN/STOP key or POWER key to interrupt the operation.

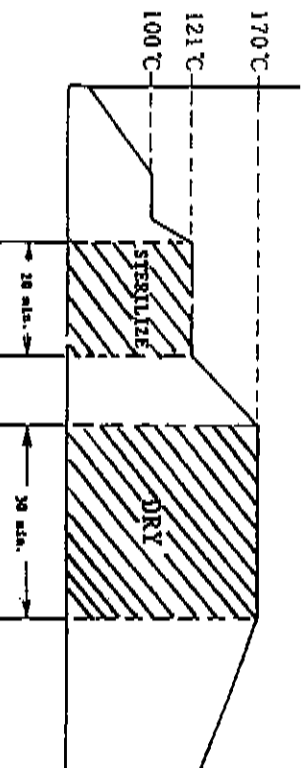
For Sterilization Only

1. Switch (PRESS) ON the POWER key.
2. Set up a program for temperature and time. Refer to page 9, "Temperature Control Operation Method."
3. Press RUN/STOP key to start the program.
4. To view the set temperature and time, press SET/MEAS key.
5. When sterilization is completed and the interior temperature becomes low enough, the alarm will sound. Now objects in the basket can be removed from the autoclave.
6. Press the RUN/STOP key or POWER key to interrupt operation.
7. When the instrument is not in use, press the POWER key and turn off the circuit breaker on the back of the operation panel.

7. TEMPERATURE CONTROL OPERATION METHOD

1. Sterilize Plus Automatic Dry

Example: Program Bank No. 2



- Press SET/MEAS key. Display shows parameters of the program which were previously used.
- If you need to dry after sterilization, press DRY key. Light will come on.
- Press setting key (up/down) to select temperature for sterilization. Microprocessor allows you to set sterilization temperature from 115°C to 128°C.
- Press display change key (temperature/time) to set time. Light will come on. Press setting key to select time for sterilization. You can set it for a maximum of 99 hours, 59 minutes. When you continue to push setting key, time will keep going up.
- Press display change key (sterilize/dry) to obtain dry mode. Press display change key (temperature/time) to temperature setting.
- Press setting key to select the temperature for drying. Microprocessor allows you to set from 150°C to 180°C.
- Press display change key (temperature/time) to time to select the time for drying. You can set it for a maximum of 99 hours, 59 minutes.
- Press RUN/STOP key to start.

You can store three (3) different sets of parameters in three (3) banks.

Before you start to set the parameters, press SET/MEAS key to call one of three (3) different sets of parameters. Then press PROG key. Bank number starts flashing. Press setting key to identify bank number. You have three (3) banks for storing parameters. Press display change key (temperature/time) for setting temperature.

2. Sterilize Only

- a. Press SET/MEAS key. Display shows the parameters of the program which was previously used. Program number will be flashing.
- b. Press setting key (up/down) to select temperature for sterilization. Microprocessor allows you to set sterilization temperature from 115°C to 128°C.
- c. Press display change key (temperature/time) to set time. Light will come on. Press setting key to select time you sterilize. You can set the timer for a maximum of 99 hours, 59 minutes. When you continue to push setting key, the time will keep going up.
- d. Press RUN/STOP key.

8. PRECAUTIONS

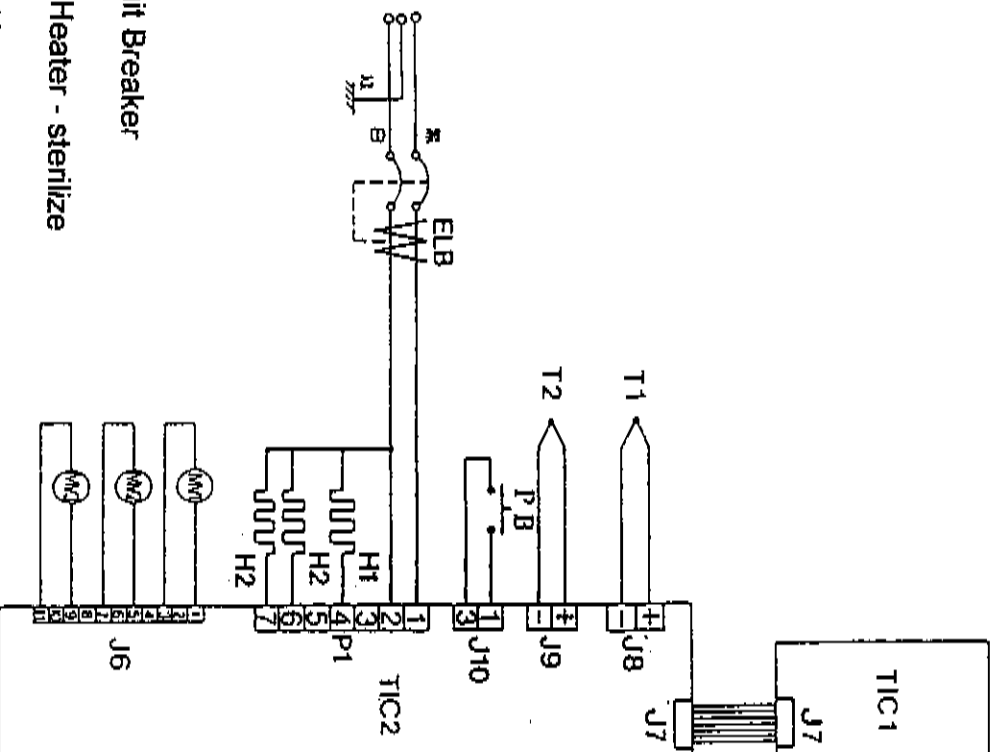
1. When autoclave runs at 128°C for sterilization, excessive pressure release is activated due to sudden drop of outside temperature. The excessive pressure release is located on rear panel.
2. During sterilization, pressure is built up in chamber with high temperature steam.
CAUTION: Close lid securely. DO NOT open lid during sterilize and dry modes; otherwise, high temperature steam leaks from lid. Open lid when 1) pressure gauge goes down to 0, 2) buzzer for completion of whole cycle is activated and 3) lamp for RUN / STOP key is off.
3. Specially designed lid gasket increases tightness as chamber pressure is increased.
4. **CAUTION: Never open drain cap during operation; otherwise pressurized hot steam and hot water come out of the drain port.**
5. **CAUTION: Right after sterilize or dry operation, lid, arm and inside chamber surface are very hot.**
6. After sterilizing, autoclave drains hot water from chamber. Autoclave might make noise, but this is normal.
7. Before sterilization, make sure water level in chamber is at proper level. Use distilled or deionized water.
8. The autoclave is not explosion proof. **DO NOT INSERT FLAMMABLE MATERIAL.**
9. Be sure to use a basket designed by Yamato. When the basket is set in the chamber, make sure the object in basket does not block both air release holes in chamber.
10. The stainless basket should always be used for sterilization. Never place any glass, plastic, etc directly on the bottom plate. Never rest any glass, plastic, etc. directly on the side of the chamber. If sterilizing media, be sure to use the shelf raised one or two levels from the bottom.
11. It is recommended that the chamber surface and pipe heater be cleaned two times per month.
12. Make sure drain strainer is installed at the bottom of the chamber.
13. Control panel is not waterproof.

9. TROUBLESHOOTING

<u>Error Message</u>	<u>Problem</u>
ERR 1.....	Sensor disconnected
ERR 2.....	Triac short circuit
ERR 3.....	Heater disconnected
ERR 4.....	Low water level

For further information, call Technical Service at 1-800-2-YAMATO (292-6286)

10. WIRING DIAGRAM



ELB	Circuit Breaker
H1	Pipe Heater - sterilize
H2	Band Heater - dry
MV1	Magnetic Valve 1
MV2	Magnetic Valve 2
MV3	Magnetic Valve 3
PB	Pressure Release Switch
T1	Temperature Sensor - chamber temperature
T2	Temperature Sensor - low water level
TIC 1	Thermal Indicator Control 1
TIC 2	Thermal Indicator Control 2

11. ACCESSORY LISTING

Item Number	Item Description
241085	Basket for SM-22
241086	Basket for SM-32/52
241096	Basket with adjustable shelf SM-22
241095	Basket with adjustable shelf SM-32
241094	Basket with adjustable shelf SM-52
SM-22-0256	Bottom plate for SM-22
SM-52-0256	Bottom plate for SM-32/52
SM-22-0168	Strainer
SM-22-0161	Bottom sensor
SM-22-0228 ¹⁰⁴	Control power board (internal)
SM-22-0227 ²²³	Key/display board (external)
SM-22-241096	Adjustable shelf only for SM-22
SM-32-241095	Adjustable shelf only for SM-32
SM-52-241044	Adjustable shelf only for SM-52