Chapter 5 Inspection and maintenance

This chapter describes how to perform periodic inspection and maintenance to ensure the long operating life of the chamber.

◆ Note ◆

<Operations to be performed by the customer>

- Use the chamber according to the methods indicated in the operation manual and perform independent periodic inspections.
- Perform inspections before and after operation.
- Replace the consumables and regular replacement parts indicated by ESPEC.

5.1 Inspection and maintenance items

5.1.1 List of consumables and regular replacement parts

The following parts must be replaced periodically to maintain the performance and functionality of the chamber. Promptly replace them at the specified interval if not sooner.
Maintenance service is also provided by ESPEC.
Contact your distributor or ESPEC to request the maintenance and inspection service and components.

Table 5.1 List of consumables

Part	Recommended replacement period
Oil filter element	10,000 h
Air filter element	10,000 h

Table 5.2 List of regular replacement parts

Part	Recommended replacement period	Replacement method and approximation
Test area door packing	7 years	When the packing is deformed or damaged (hot or cold air leaks from the door)
Damper packing		When the packing is deformed or damaged (hot or cold air leaks from the damper)
Silicon cord heater (for damper)		When condensation or icing occurs due to insufficient heating provided by the silicon cord heater
Silicon cord heater (for drain)		When condensation or icing occurs due to insufficient heating provided by the silicon cord heater
Door drive belt		When the door drive belt is damaged and the door is not driven sufficiently
Door switch		When door malfunctions occur
Temperature sensor		When chamber errors occur due to temperature sensor disconnections or connection failures (temperature control unit sensor disconnection error)
Temperature switch (OHP3 (TS1), TS2)		When chamber errors occur due to temperature switch malfunctions (external overheating/overcooling)
Air cylinder (for door) (including installation brackets)		When air leaks from the air cylinder or when strange sounds or door malfunctions occur
Air cylinder (for damper)		When air leaks from the air cylinder or when strange sounds or damper malfunctions occur
Solenoid valve (for air circuit)		When strange sounds are emitted from the solenoid valve or when solenoid valve malfunctions cause door or damper malfunctions
AC fan motor (electrical compartment exhaust fan)		When strange sounds are emitted from the fan motor or when fan motor malfunctions occur

* The above recommended replacement periods are the recommended periods and do not indicate exactly when replacements will be needed. The actual values will depend on the usage conditions. If anything strange is detected during daily checks or maintenance, replace the part.

5.1.2 Inspection items

For a description of each item, see "5.2 Inspection".
If the inspection items listed below do not operate properly, contact your distributor or ESPEC.

Table 5.3 Inspection items

Operation inspection item	Inspection period
Circuit breaker (main power switch) trip test	• Once a month • Before long-time continuous operation
Overheat protector operation test	• Before starting operation • Before unattended operation
Overcool protector operation test	• Before starting operation • Before unattended operation
Water suspension relay operation test (water-cooled chamber)	Once every 3 months

5.1.3 Maintenance items

For a description of each item, see "5.3 Maintenance".

Table 5.4 Maintenance items

Maintenance item	Maintenance period
Water circuit leakage inspection	Once a day
Test area cleaning	Before starting operation
Electrical/machinery compartment cleaning	Once a year
Strainer element cleaning and replacement (water-cooled chamber)	Once every 3 months (cleaning) or when the high stage high pressure (G_{11}) read on the gauge exceeds 2 MPa (20 kg/cm²)
Cleaning the cooling water circuit	Once a year
Fuse replacement	Whenever a fuse blows
Air filter cleaning and replacement	• Once a month (cleaning) • Once every 10,000 hours (element replacement)
Oil filter cleaning and replacement	• Once a month (cleaning) • Once every 10,000 hours (element replacement)
Door drive belt check and replacement	• Once a year (inspection) • Once every 7 years (replacement)
Refrigerator oil check	Once every 6 months
Compressor pressure inspection	Once a month
Cleaning the air cooled condenser (air-cooled chamber)	Once a month

* For the arrangements to perform when you will not use the chamber for a long time, see "5.3.11 Arrangement before long periods of disuse".

5.1.4 Adjustment list

Adjustments are required to maintain chamber functionality and performance. When the adjustment period is reached, contact your distributor or ESPEC.

Table 5.5 Adjustment list

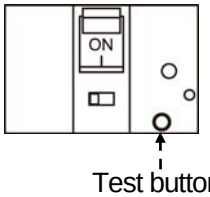
Adjustment item	Adjustment period
Air pressure switch	Once every 2 years
Regulator pressure	Once every 2 years
Damper opening/closing speed	Once every 2 years
Test area door opening/closing speed (optional automatic door)	Once every 2 years

5.2 Inspection

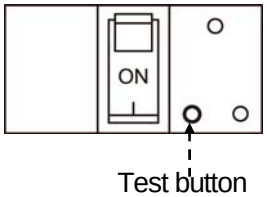
5.2.1 Circuit breaker (main power switch) trip test

Test the circuit breaker (main power switch) operation once a month or before starting long-term continuous operation.
With the circuit breaker (main power switch) on, gently press the test button. Pressing the test button should cause the circuit breaker (main power switch) lever to lower.

200, 220 VAC chambers



Models
TSA-43EL
TSA-73EL, 73ESA, 73ESW
TSA-103EL, 103ES



TSA-73EH
TSA-203EL, 203ES
TSA-303EL

380, 400, 415 VAC chambers

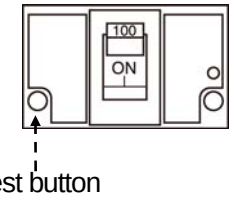


Fig 5.1 Test button position

◆ Reference ◆

When the circuit breaker (main power switch) lever lowers, it stops at a point halfway between on and off. To turn on the power, lower the lever to the off position, and then raise it to the on position.

5.2.2 Overheat protector operation test

Before starting chamber operation, test the operation of the overheat protector.

<Procedure>

1) Check that the circuit breaker (main power switch) is on.

2) Press the power switch on the instrumentation panel to turn on the chamber.

3) Press the operating status box to switch to the operation screen. Next, press the START TEST button under <Operation Mode>, and then press Yes on the screen that is displayed to confirm your selection.
The test will start.
Perform the overheat protector operation test in high temperature exposure mode.

4) Set the overheat protector to a temperature that is approximately 5˚C lower than the test area temperature.
If the overheat protector is operating normally, a buzzer will sound and an alarm will appear on the instrumentation screen.
If no alarm is generated, the chamber is malfunctioning. Contact your distributor or ESPEC.

5) To cancel the buzzer, press the Buzzer Stop button.

6) Turn off the instrumentation panel power switch to return the setting to the previous temperature.

5.2.3 Overcool protector trip test

Before starting chamber operation, test the operation of the overcool protector.

<Procedure>

1) Check that the circuit breaker (main power switch) is on.

2) Press the power switch on the instrumentation panel to turn on the chamber.

3) Press the operating status box to switch to the operation screen. Next, press the START TEST button under <Operation Mode>, and then press Yes on the screen that is displayed to confirm your selection.
The test will start.
Perform the overcool protector operation test in low temperature exposure mode (a temperature of -10°C or lower).

4) Set the overcool protector to a temperature that is approximately 5˚C higher than the test area temperature.
If the overcool protector is operating normally, a buzzer will sound and an alarm will appear on the instrumentation screen.
If no alarm is generated, the chamber is malfunctioning. Contact your distributor or ESPEC.

5) To cancel the buzzer, press the Buzzer Stop button.

6) Turn off the instrumentation panel power switch to return the setting to the previous temperature.

5.2.4 Water suspension relay operation test

Once every three months, test the operation of the water suspension relay.

<Procedure>

1) Check that the circuit breaker (main power switch) is on.

2) Press the power switch on the instrumentation panel to turn on the chamber.

3) Press the operating status box to switch to the operation screen. Next, press the SETUP ONLY button under <Operation Mode>, and then press Yes on the screen that is displayed to confirm your selection.
The chamber starts performing setup operations.

4) Close the primary water supply valve.
If the water suspension relay is operating normally, a buzzer sounds and a screen displaying an alarm appears on the instrumentation.
If no alarm is generated, the chamber is malfunctioning. Contact your distributor or ESPEC.

5) To cancel the buzzer, press the Buzzer Stop button.

6) Turn off the instrumentation panel power switch, and then open the primary water supply valve.

5.3 Maintenance

5.3.1 Cleaning the air-cooled condenser (air-cooled chamber only)

WARNING

Be sure to turn off the circuit breaker (main power switch) before detaching the rear panels.
The machinery compartment contains rotating and moving parts such as the fan. Detaching the rear panels with the circuit breaker (main power switch) on may lead to injury.

CAUTION

Never touch the condenser fins with bare hands.

The fins may cut your hands.

The air-cooled condenser on the rear of the chamber may be clogged if dust or similar substances affix to the fins. In this situation, sufficient cooled air cannot enter into the condenser. This reduces the performance and activates the safety devices to disable operations. In addition, the condenser operating for a long time in this manner may lead to refrigerator malfunctions.
Clean the condenser fins once per month.

<Procedure>

1) Turn the circuit breaker (main power switch) off to stop the chamber, and then detach the rear panels.

2) Vacuum up the dust on the slits of the rear panels and on the condenser fins with a vacuum cleaner.
If dust cannot be removed, pour water on the condenser to clean it.

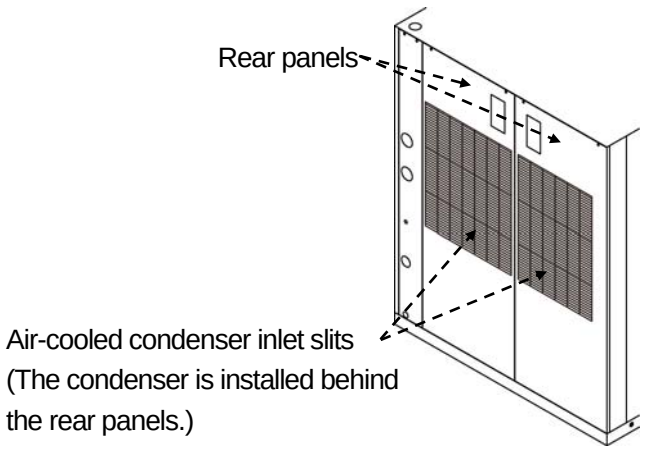


Fig. 5.2 Cleaning the slits of the rear panels and the condenser fins

3) Reattach the rear panels where they were.

◆ **Note** ◆

Do not bend the condenser fins. If the condenser fins are bent, heat cannot be normally exchanged and the performance of the chamber is reduced.

◆ **Energy Saving Advice** ◆

CHECK! As a guideline, clean the condenser fins once a month.

Regular cleaning of the fins can prevent lowered refrigeration capacity and reduce the load on the exhaust fan.

5.3.2 Water circuit leakage inspection

Water leaking from the water circuit can adversely affect the installation area and cause problems. Check for water leaks once a day.

<Procedure>

1) Check the drain pipe connection ports for leaks.

2) Check the connecting parts of the strainer and nipple for leaks.

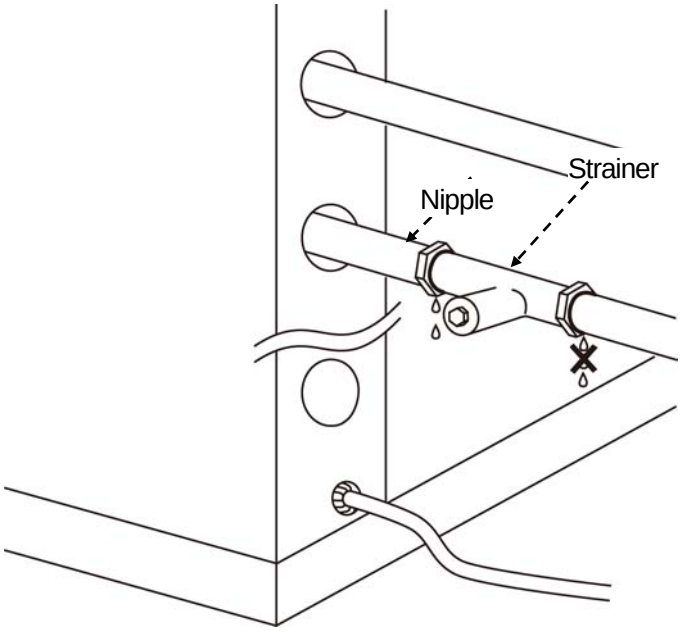


Fig. 5.3 Water leak inspection

◆ **Note** ◆

If you find a water leak, identify and repair the leaking location.

5.3.3 Test area cleaning

Dust and impurities that adhere to the test area floor and walls can be carried throughout the system by air currents and eventually stick to heaters, air circulators, and other components. This can lead to problems and distort test results. Clean the test area before and after tests.

<Procedure>

1) Open the test area door.
2) Wipe the test area with a soft cloth.
3) Close the test area door.

5.3.4 Electrical/machinery compartment cleaning

Dust deposits in the electrical or machinery compartment can lead to malfunctions. Clean these compartments once a year.

<Procedure>

1) Check that the circuit breaker (main power switch) is off.
2) Open the electrical compartment door and the machinery compartment door.
3) Use a vacuum cleaner or other means to clean out the dust that has accumulated in the electrical compartment and machinery compartment.
4) Close the electrical compartment door and the machinery compartment door.

5.3.5 Strainer element cleaning and replacement

Water deposits and foreign matter can accumulate on the strainer element attached to the cooling water supply pipe, which may lead to clogging. In this situation, the amount of water supplied will be insufficient, which may cause the water suspension relay to activate and make chamber operations impossible.
Clean or replace the strainer element approximately once every three months.
The frequency with which cleaning or replacement is necessary varies depending on the cleanliness of the cooling water, so exercise your own judgment in determining how often this maintenance is required.

Notice

- **If the cooling water or cooling tower is being shared with a different device, close the valve on the secondary drainage pipe in advance.**

  Back pressure may be applied to the secondary drainage pipe, causing the cooling water to back-flow, which may lead to water leaking from the strainer.

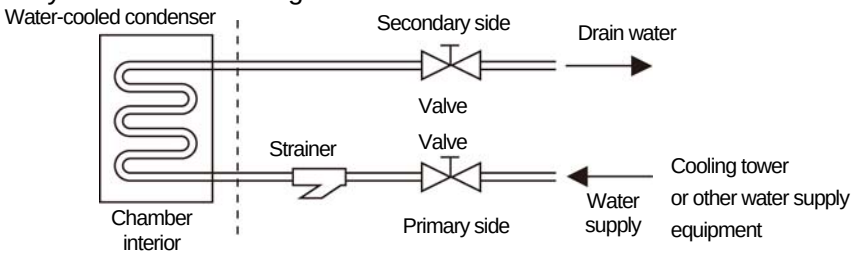


Fig. 5.4 Sharing cooling water or the cleaning tower

- **If cooling water remains within the chamber, water may leak from the strainer when the strainer element is replaced.**

<Procedure>

1) Close the primary valve.
   If the secondary drainage pipe has a valve, close it as well.

2) Place a tray or other appropriate container with which to catch the water under the strainer.

3) Loosen the strainer cap, and then remove the strainer element.

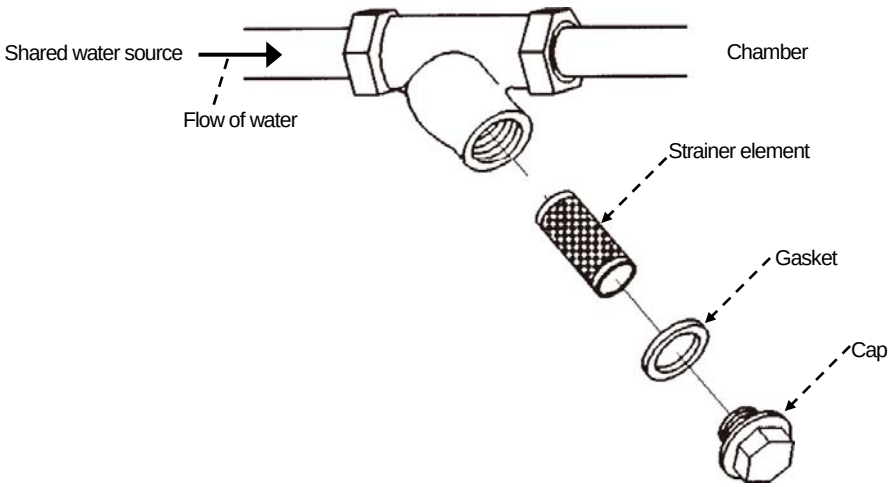


Fig. 5.5 Removing the strainer element

4) Use a brush or similar tool to clean the strainer element.
   If you cannot sufficiently clean the strainer element, replace it with a new part.

5.3.6 Cleaning the cooling water circuit

Scale accumulated inside of the piping may decrease the heat exchange capacity, and the high pressure switch may trip as a result. Clean the inside of the piping once a year.
Otherwise, too much scale may cause heat exchange (condenser) malfunction and a replacement will be necessary in the worst case. For cleaning, contact your distributor or ESPEC. (Cleaning is subject to billing.)

5.3.7 Fuse replacement

Over prolonged testing, fuses can weaken and blow.
When a fuse blows, replace it as explained below.

◆ Note ◆
If the new fuse blows as soon as the power is turned back on, contact your distributor or ESPEC.

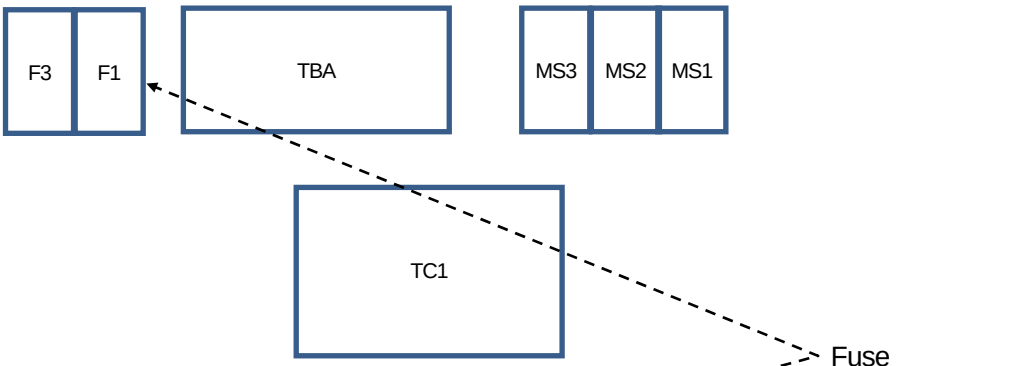
<Procedure>

1) Check that the circuit breaker (main power switch) is off.

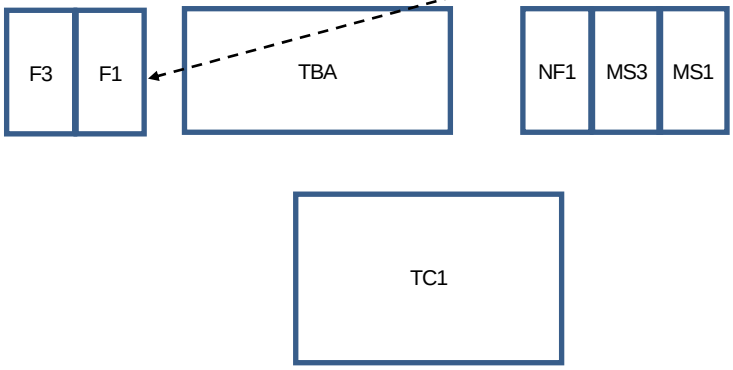
2) Remove the screws from the electrical compartment door, and then open the electrical compartment door.

3) Replace the blown fuse with a new one.

<TSA-43EL>



<TSA-73EL, 73ES, 103EL, 103ES>



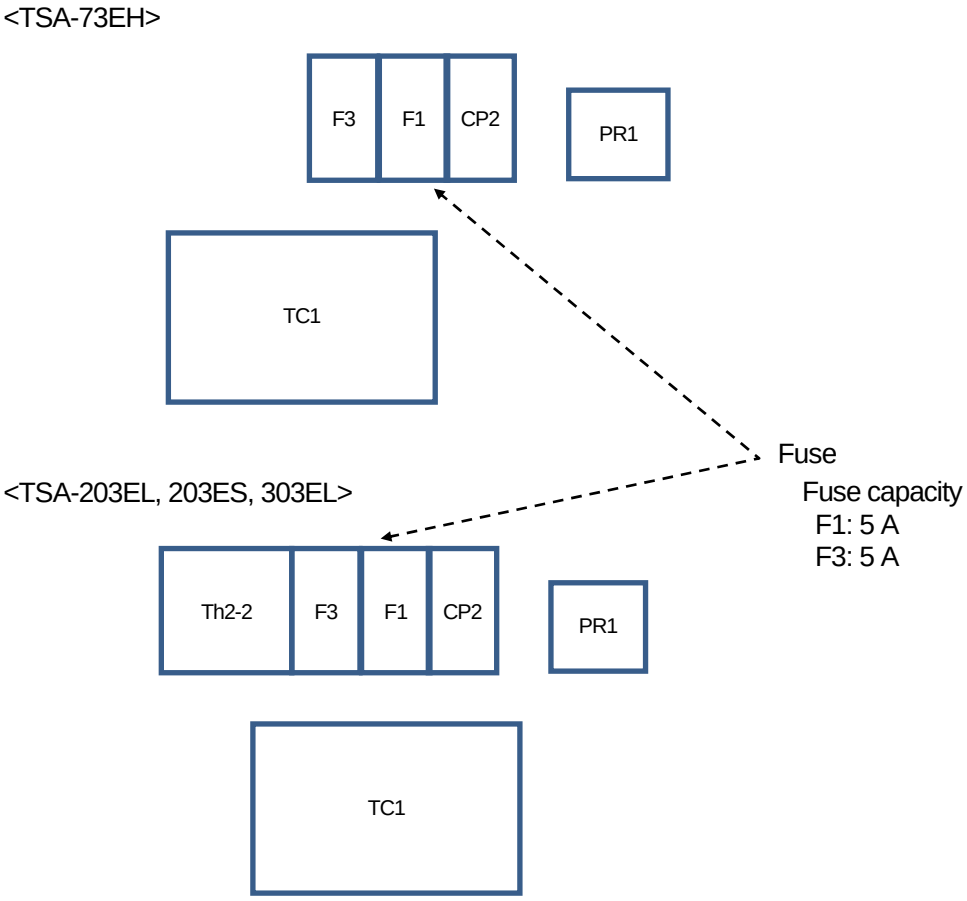


Fig. 5.6 Fuse replacement

4) Close the electrical compartment door.

5.3.8 Air filter and oil filter cleaning and replacement

As dirt, tar, carbon, dust, or other substances accumulate on the air and oil filters of the air circuit, drainage gets obstructed. Incomplete drainage may lead to problems and even breakdowns in the air circuit parts. Clean or replace the air filter and oil filter about once a month.

CAUTION

Do not remove the bowl guards until the pressure gauge reads 0 MPa.

If air remains in the air circuit, the bowl guards can separate from the chamber with sufficient force to injure someone.

<Procedure>

1) Check that the circuit breaker (main power switch) is off.

2) Close the primary air supply valve, then disconnect the air supply tube from air supply port at the chamber rear to release air.

3) Open the machinery compartment door.

4) Press on the bowl guard lock, turn it to the ▽ mark, and then detach the bowl guard.

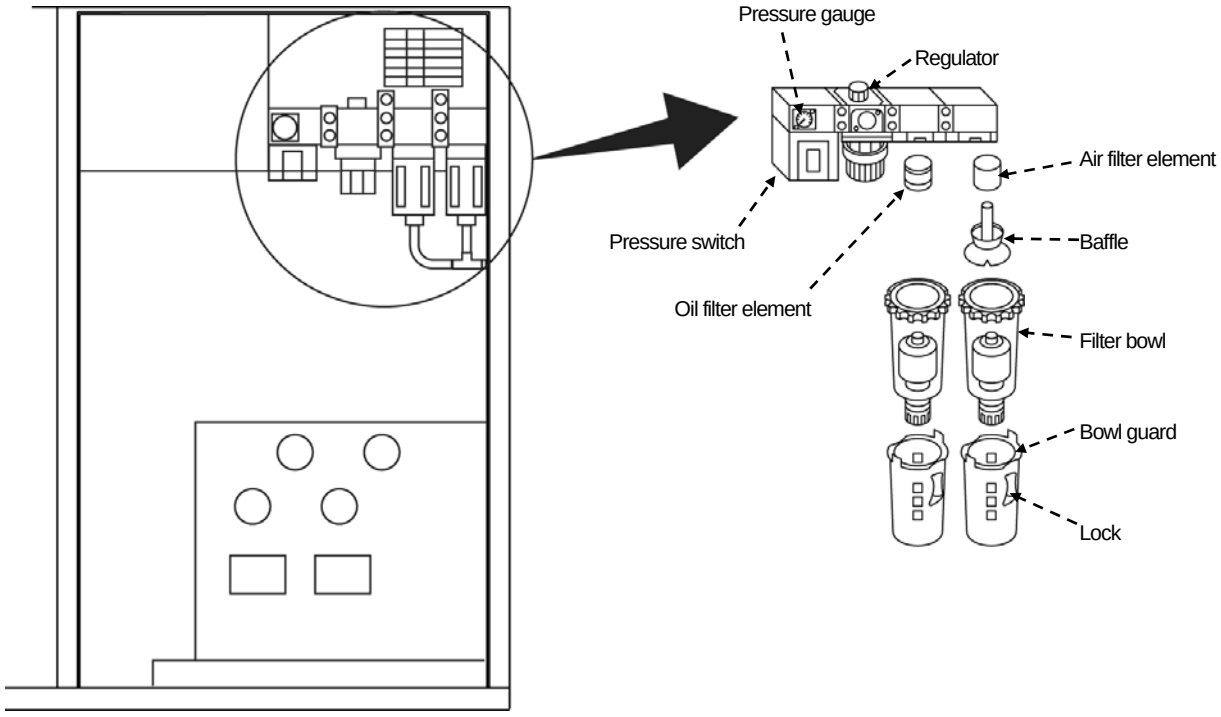


Fig. 5.7 Removing the bowl guards

5) Turn the baffle until it is loose, and then remove the air filter element.
Use an M6 box wrench to remove the oil filter element.

6) Wash the air filter, oil filter bowls, and the air filter element with a neutral detergent, and then rinse these parts clean.

7) Use a soft, dry cloth to blot the moisture on the filter bowls and air filter element.

◆ Note ◆

- Do not wash the parts with synthetic oils (phosphate ester base), organic solvents, or chemicals (thinner, carbon tetrachloride, etc.).
- Do not expose the parts to direct sunlight.

◆ Reference ◆

If badly soiled, the oil filter element cannot be reused even if it is washed. In this situation, replace the element. (Replace the element once every 10,000 hours.)

5.3.9 Door drive belt check

Inspect the door drive belt once a year.

<Procedure>

1) Check that the circuit breaker (main power switch) is off.

2) Remove the screws that lock the front right and left panels to open them.

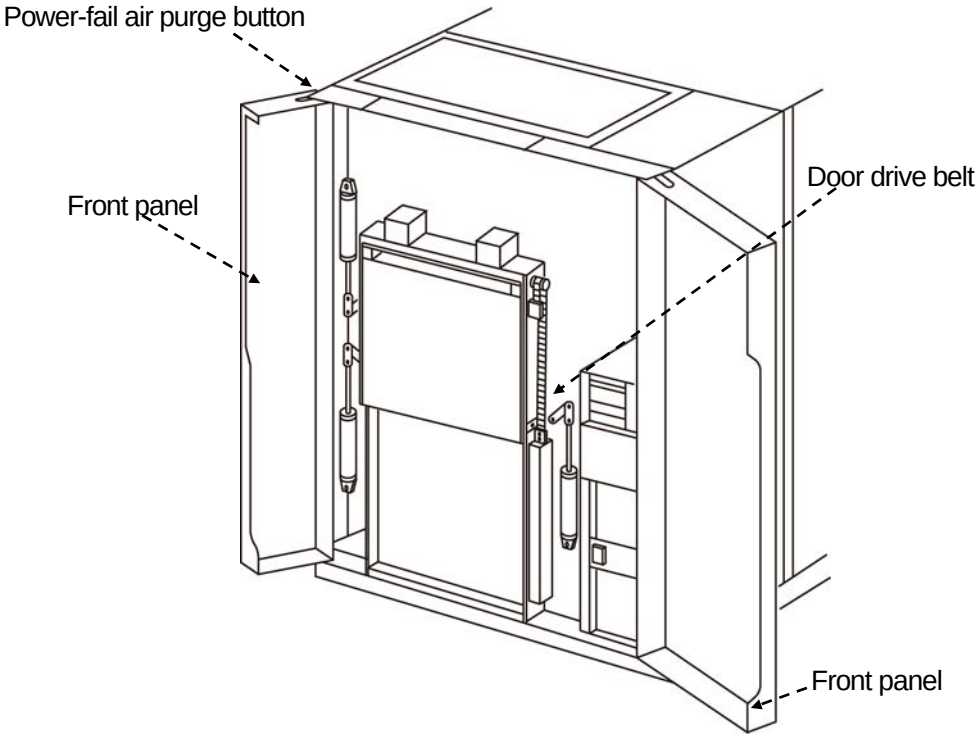


Fig. 5.8 Door drive belt

3) Press the power-fail air purge button in the top left-hand corner of the chamber front.

4) Slide the test area door up and down, checking that there are no cracks in either of the belts. If there are any problems with the belts, contact your distributor or ESPEC.

5) Close the front right and left panels, and then lock them in place with the screws.

5.3.10 Refrigerator oil check

To maintain refrigerator functionality and performance, inspect the refrigerator oil once every 6 months.

WARNING

Be sure to turn off the circuit breaker (main power switch) before detaching the rear panels.

The machinery compartment contains rotating and moving parts such as the fan. Detaching the rear panels with the circuit breaker (main power switch) on may lead to injury.

<Procedure>

1) Check that the circuit breaker (main power switch) is off.

2) Detach the rear panels.

3) Use the level gauge at the bottom of the refrigerator to inspect the refrigerator oil.
   Inspection details
   • The oil level should appear within the gauge.
   • The oil should not be discolored. (The color should not be black.)
   If there are any problems with the refrigerator oil, contact your distributor or ESPEC.

4) Reattach the rear panels where they were.

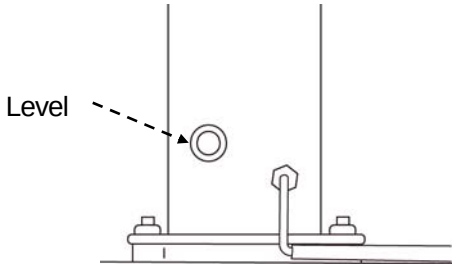


Fig. 5.9 Level gauge

5.3.11 Arrangement before long periods of disuse

If the chamber will not be used for an extended period of time, be sure to perform the steps shown below. Failure to do so may result in inaccurate testing and reduce the operating life of the chamber.

- Dry the test area (run the chamber).
- Turn off the circuit breaker (main power switch) and the primary power supply, and then use the circuit breaker handle stopper to prevent accidental operations of the circuit breaker (main power switch).

■ Dry the test area (run the chamber)

Operate the chamber to dry out its test area and cold chamber.
Periodically dry out the test area and the cold chamber.

<Procedure>

1) Check that the circuit breaker (main power switch) is on.

2) Press the power switch on the instrumentation panel to turn on the chamber.

3) Press the operating status box to switch to the operation screen. Next, press the DRY MODE button under <Operation Mode>, and then press Yes on the screen that is displayed to confirm your selection.
The chamber starts performing dry operation.

4) The chamber will perform dry operation and will automatically stop when the time set for Dry Time on the Recovery Conditions screen (Chamber setup) elapses.

5) Press the instrumentation panel power switch.
Press Yes on the screen that is displayed to confirm your selection.
The instrumentation turns off.

■ Turn the power off

<Procedure>

1) Turn the circuit breaker (main power switch) off.

2) Prepare the included circuit breaker handle stopper.

3) Set the circuit breaker handle stopper as shown below.

① Setting the 200 V, 220 V (TSA-43EL, 73EL, 73ES, 103EL, 103ES) circuit breaker handle stopper

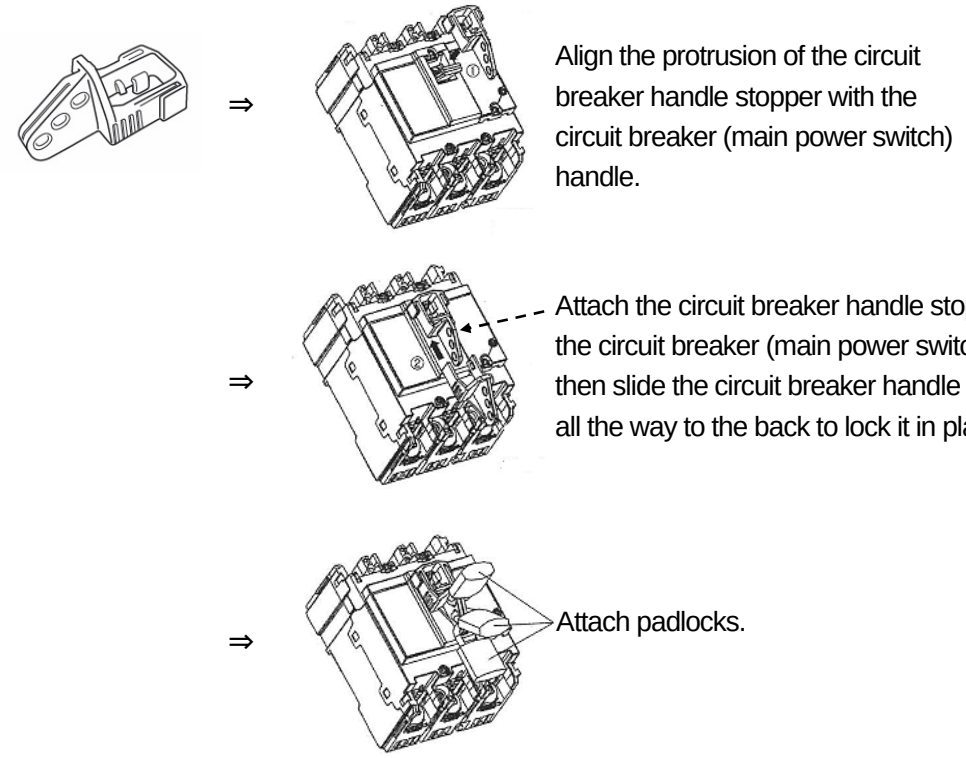


Fig. 5.10 200 V, 220 V type (TSA-43EL, 73EL, 73ES, 103EL, 103ES)

② Setting the 200 V, 220 V (TSA-73EH, 203EL, 203ES, 303EL) circuit breaker handle stopper

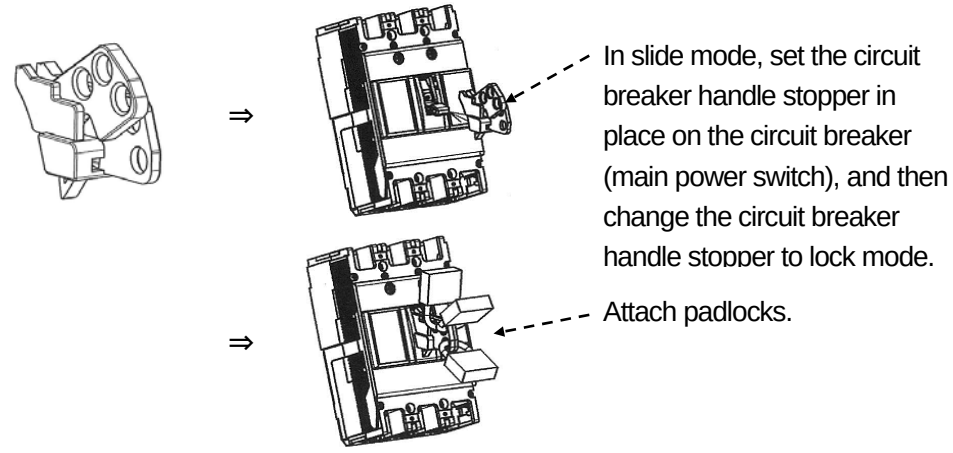


Fig. 5.11 200 V, 220 V type (TSA-73EH, 203EL, 203ES, 303EL)

③ Setting the 380 V, 400 V/415 V (all models) circuit breaker handle stopper

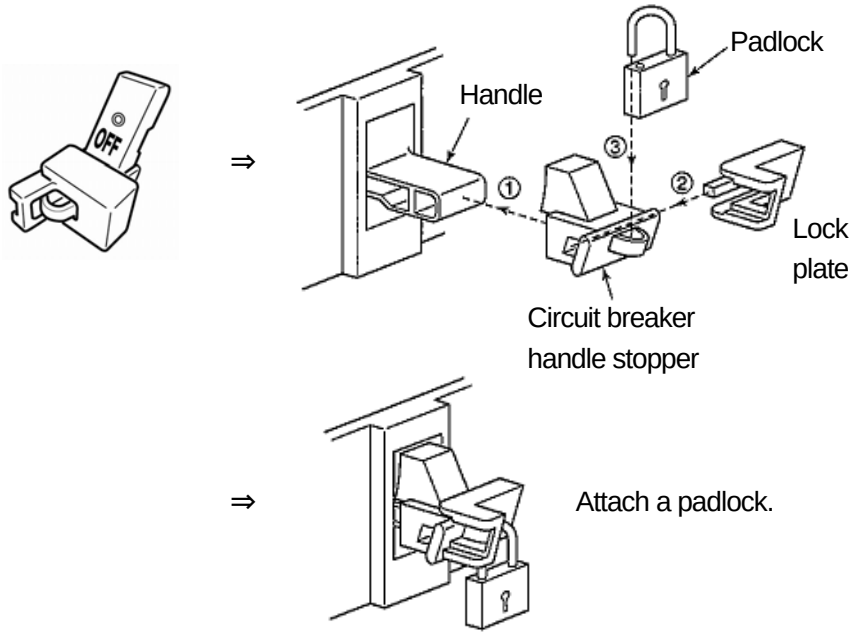


Fig. 5.12 380 V, 400 V/415 V type (all models)

4) Turn off the primary power supply.

5) Close the cooling water supply valve.

6) Turn off the water supply system (cooling tower).

◆ **Energy Saving Advice** ◆

CHECK! Turn off the instrumentation panel power switch and the circuit breaker (main power switch) on the chamber.

Reduce the standby power.
If the chamber will not be used for an extended period of time, turn off the circuit breaker (main power switch) to reduce the standby power.

Turn on the circuit breaker (main power switch) one hour before using the chamber. (When the ambient temperature is 20°C.)

5.3.12 Compressor pressure check

Abnormal compressor pressure can lead to the pressure switch tripping and problems with the refrigeration circuit.
Check the pressure once a month.

<Procedure>

1) Check that the circuit breaker (main power switch) is on.

2) Press the power switch on the instrumentation panel to turn on the chamber.

3) Press the operating status box to switch to the operation screen. Next, press the START TEST or SETUP ONLY button under <Operation Mode>, and then press Yes on the screen that is displayed to confirm your selection.
The chamber starts performing the test or setup operations.

4) 30 minutes after starting operation, use the pressure gauge in the machinery compartment to check that the pressure is within the normal range.

Table 5.6 Normal pressure ranges

Pressure gauge	Normal range (MPa)	
	Air-cooled	Water-cooled
Low stage low pressure	-0.04 to 0.60	-0.04 to 0.60
Low stage high pressure	0.40 to 2.10	0.50 to 2.10
High stage low pressure	-0.04 to 0.80	-0.04 to 0.70
High stage high pressure	0.70 to 2.60	1.00 to 2.10

5) Press the STOP button under <Stop Ope.> to stop operation.

◆ Note ◆

If the pressure value is outside of the normal range, try correcting the problem as explained in "HI STAGE REFRIG. PRESSURE ERR" or "LOW STAGE REFRIG. PRESSURE ERR" of "Table 6.1 List of alarms".