

## Attention Customers:

Shimadzu Industrial Systems Co., Ltd

### Request for Safety Inspections for Products (Industrial Furnaces) in Extended Use

Thank you for choosing Shimadzu products.

Shimadzu industrial furnaces are used by many of our customers for many years. Some malfunctions have been noted to date however in instruments used for an extended period, and so we would like to provide information on such cases and on related inspections.

If you find it difficult to implement the recommended inspections by yourself, we can provide such services on request, so by all means contact us for details. Thank you for your cooperation in ensuring the continued safe use of our products.

#### 1. Malfunctions

##### 1.1 Malfunctions of the oil diffusion pump

In instruments that use an oil diffusion pump, problems have occurred following oil replacement for the oil diffusion pump. After oil replacement, if the pump is heated with residual air remaining instead of establishing a vacuum within the pump, intense ignition within the pump has occurred, causing soot to spew from the furnace doors.

Causes of this phenomenon may include the following.

- (1) The rubber vacuum hose connecting the oil diffusion pump and the auxiliary pump deteriorates and collapses, so a vacuum cannot be established normally.
- (2) A decrease in the performance of the auxiliary pump
- (3) External leakage of the valves in the piping
- (4) Contamination of the oil in the oil diffusion pump used (when the oil is topped up rather than replaced)

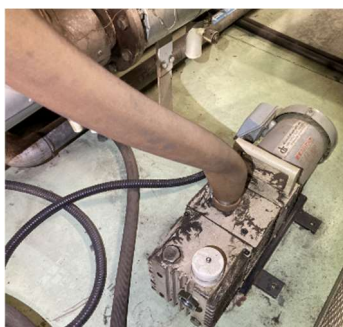


Photo 1 Collapse of the rubber vacuum hose

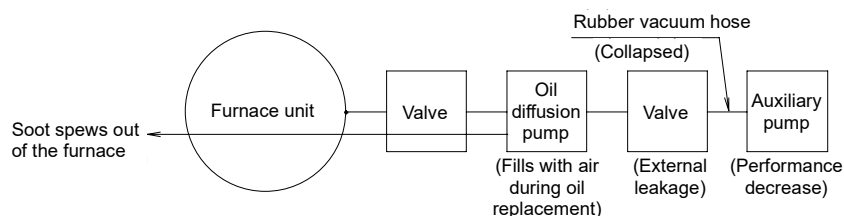


Figure 1 Overview Schematic

## 1.2 Malfunctions in instruments using hydrogen gas

Loud noise has been heard during the degreasing heating process at atmospheric pressure using hydrogen gas, and during the process of replacement with nitrogen within the furnace after degreasing. When the instrument was checked, it was determined that the carbon parts within the furnace had been damaged. In the instrument, hydrogen is burnt in the instrument discharge unit. It is thought that extinguishing this flame leads air to become mixed in, possibly igniting internally, or that the hydrogen replacement time is possibly insufficient. With these instruments, specifying the exact situation is difficult due to malfunctions of the meters that measure and record the combustion temperature, so it has not been possible to clearly specify the cause.

Causes of this phenomenon may include the following.

- (1) It could not be ensured that the value of the replacement flowrate (L/min) × replacement time (h) is at least 3.3 times the furnace capacity.
- (2) The fire detection temperature sensor malfunctions, and fires cannot be detected.
- (3) There are leaks in the piping, and so air (O<sub>2</sub>) unexpectedly flows into the interior of the furnace.
- (4) There are leaks in the piping, and the confirmation time setting for the automatic leak check function is insufficient, so leaks in the piping system cannot be detected.



Photo 2 Damage inside the furnace

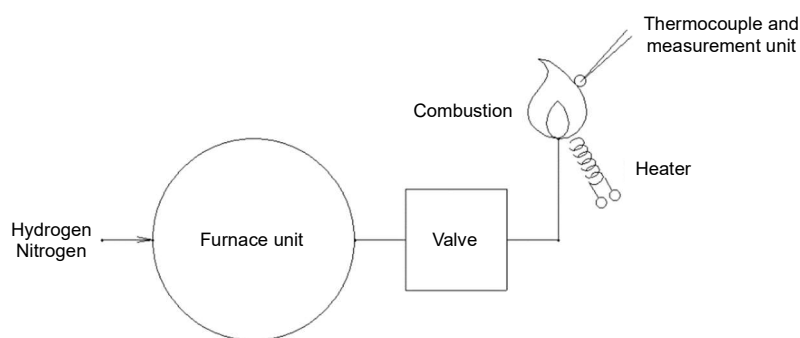


Figure 2 Overview Schematic

## 1.3 Malfunction of the heater system breaker

Ignition of the breaker in the power panel has occurred. Damage has been severe, and it has not been possible to specify the exact cause. However, the surfaces of the adjacent terminals are unusually oxidized, and they have been operating for an extended period (approximately 30 years), so it is likely that surface oxidation of the contacts has progressed, and contact resistance has increased, potentially leading to heat generation and ignition.

In general, the causes of breaker fires can include the following.

- (1) Loosening of the contact terminal connections leads to heat generation.
- (2) Surface oxidation of the contacts progresses, and the contact resistance increases, generating heat.
- (3) The insulation resistance decreases, causing electrical shorts and grounding.
- (4) The ambient room temperature is high, and the temperature in the panel rises, accelerating the progression of the above-mentioned factors.

## 2. Request for Inspection of Instruments

Kindly inspect the following items, including inspections related to the cases outlined above, to prevent a decrease in safety due to age-related deterioration. In the event that you have difficulty with such inspections, contact Shimadzu to receive an estimate for inspections and replacement procedures.

Applicable System	Presumed Risk	Inspection Items	Check
Instruments Using Oil Diffusion Pumps	Damage and explosion of the oil diffusion pump	Visually check the rubber vacuum hose.	
		Check the individual capacity of the auxiliary pump (latter stage pump).	
		Checks the oil contamination in the diffusion pump and the replacement frequency.	
		Check the disconnection of the oil diffusion pump heater and check that there is no loss due to heater deformation.	
		Visually check if water is flowing into the oil diffusion pump.	
		Check that external leakage has not occurred.	
Instruments Using Hydrogen Gas	Explosions if there is any oxygen at high temperatures inside the furnace	Check that the element heater in the hydrogen combustion unit is not disconnected.	
		Check that the temperature of the thermocouple in the hydrogen combustion unit is normal.	
		Check that there is no problem with the pressure sensor indicator.	
		Check that the value for the replacement flowrate (L/Min) x replacement time (h) is set to at least 3.3 times the furnace capacity.	
		Check for degradation and appropriate tensile loading of the rotary pump belt.	
		Check that leaks in the exhaust piping have not occurred.	
		Check that the leak check time setting is not too short. (The time configured at the time of shipment is noted in the instruction manual.)	
Pressurized Furnaces	Open the furnace doors when pressurized	Check that the clutch ring lock mechanism is operating normally.	
	Open the furnace unit leak valve when pressurized	Check that the lock mechanism for the furnace unit leak valve is operating normally.	
	Gas is spewing from the trap safety valve because of an internal leak in the degreasing piping valves	Check that there is no rise in the pressure of the trap when the furnace interior is pressurized.	
Furnaces with Exhaust Gas Combustion Instruments at a Stage after RP	Flames appear when wax or oil build up internally	Check the inside of the exhaust gas combustion instrument. Check that there is no oil buildup or wax adhesion.	
Overall System	Ignition due to static electricity at the exhaust duct provided by the customer at the pump outlet	Check that the exhaust duct is grounded using metal piping.	
	Electric shocks from water leaks	Visually check that there is no deterioration of the instrument or cooling water hose.	
	Heat generation and ignition due to surface oxidation or loose connections of the electrical system	Visually check that the surfaces of the electrical system terminals are not oxidized, and that the connections are not loose.	

	terminals		
	The ambient room temperature is high, and the temperature in the panel rises	Check that the ambient temperature in the room is not too high, and that the temperature inside the panel is rising abnormally.	
	The insulation resistance has decreased, leading to heat generation and ignition from an electrical leak	Check the insulation resistance of the power system.	
	Is the cooling water flowing?	Check that the cooling water flowrate sensor is normal, by stopping the water to check whether the alarm is issued.	
	Overturning of the instrument due to an earthquake	Visually check that the anchor bolts are fastened.	
	The recorder is malfunctioning, and signs of problems with the safety of the instrument cannot be confirmed	Check whether the recorder is recording data normally.	

Note: In addition, to ensure a long and safe instrument operating life, check the safety manual (Ensuring Safe Usage) posted on the website.