Operating Instructions For The Pyrotec4 Series Laboratory Dyeing Unit

CONTENTS

1.0 UNPACKING AND ASSEMBLY

When packed for export, the machine will be in a wooden packing case.

The top and front of the wooden packing case are clearly marked ‘TOP’ and ‘FRONT’. These panels should be removed first. A proprietary nail-removing tool should be used to prevent damage to the packing materials.

The machine is secured to the base of the wooden packing case by plastic banding tape. This tape must be cut and removed.

The machine can be lifted clear of the base of the packing case. DO NOT ATTEMPT TO MANUALLY LIFT THE MACHINE ALONE (net weight is ~90 kilograms). Either slide the machine from the base to a point where it can be lifted mechanically or use slings under the base frame of the machine. Keep any lifting devices away from the extremities of the machine to avoid damaging it.

Inspect the machine and report any damage. If there are any additional accessories, check that these are complete. Retain the packing materials for use in the event of shipping on or returning the machine to Roaches International Ltd. In this event, goods returned or shipped on are the responsibility of the sender and the sender is responsible for ensuring that the goods are suitably packed to prevent damage in transit.

2.0 INSTALLATION

2.1 Siting the Machine

The machine may be mounted on a bench. The compact design of the Pyrotec is useful in laboratories with limited space without compromising technical sophistication. The Pyrotec is operated from the front. Access to the process chamber is from the front for easy access to all the beakers.

The machine must be sited on a flat, level firm surface. Allow 300mm workspace around the cabinet for the connection and disconnection of site services. The height of the Pyrotec is 810mm. This will ensure that the machine is positioned at the most comfortable working height.

2.2 Electrical Connections

Refer to the specification sheet at the front of this manual. This specifies the power supply requirements for the particular model.

THIS EQUIPMENT MUST BE EARTHED

An inlet supply isolator switch is fitted externally on the side of the cabinet. The cable inlet is positioned below the isolator. The rear panel must first be removed so that the electrical power can be connected directly to the isolator terminals. **Do not connect the supply to any other terminals inside the machine or serious injury and damage may occur.**

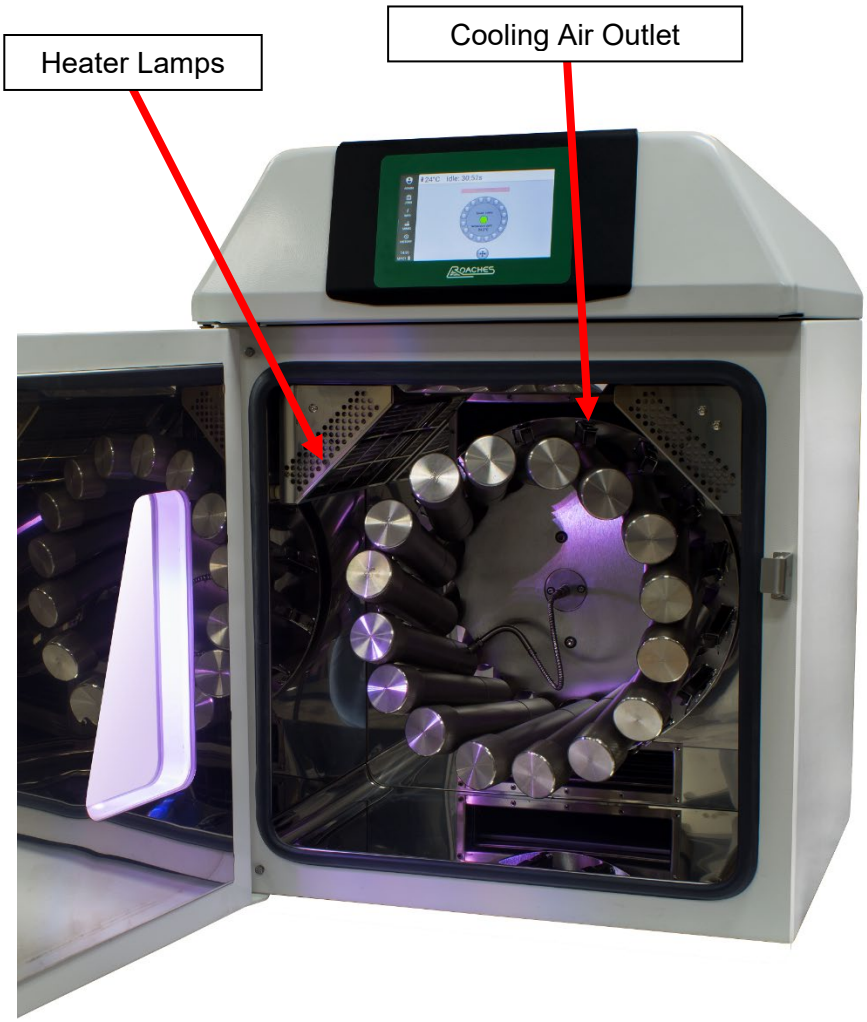
Connect the power supply in accordance with the mandatory national standards. Ensure that the cable is routed as shown in the photograph.

The machine contains motors and electronic motor control equipment and therefore it is important to install the machine on an electrical supply, which is protected by a SPECIFIC MOTOR RATED MINIATURE CIRCUIT BREAKER (M.C.B). Failure to do this may cause ‘nuisance tripping’ of standard M.C.B’s.

2.3 Heating and Cooling Systems

The heating system uses infra red lamps in the side panel of the chamber. These ‘short wave’ quartz heating lamps are an efficient energy source as only the object in the path of the light is heated and not the air in between the source and the object. The light produced is extremely bright and it is for this reason that the heating is disabled automatically when the chamber is opened. The average heating rate is nominally 3.4ºC/min (6ºF/min).

The Pyrotec is cooled with a fan. An air intake and air outlet is provided inside each process chamber to allow the ambient air to be circulated, cooling the beakers (see photo). The average cooling rate is approximately 2.5ºC/min (4.5ºF/min). The cooling system efficiency therefore depends on the ambient air temperature.


Heater Lamps
Cooling Air Outlet

3.0 SAFETY

The Pyrotec series has been designed and constructed to high safety standards, the safety features are listed below:

1. The process beakers have a cavity lid to reduce the risk of overfilling with liquor. (The 'Adchem' type lid **on the 'B' size beaker only** is slightly shorter than the standard lid and the cavities they create are therefore slightly smaller).

2. The compartment has a sturdy lid, which interlocks the heating circuit and drive circuit so that if the chamber cover is open, the heating and rotation are stopped.

3. Over temperature protection is provided with a heat output monitoring system and informative message display via the Touch Screen Control System.

4. The heating is disabled when the shaft rotation speed falls below 5 rpm or stops completely for more than 10 seconds.

5. The Programmable Control System will abort the program if the temperature sensor fails or if the temperature in the Control Beaker rises above 145ºC.

6. The compartment lid is lockable in the open position using the **lid catch.**

7. When '**Inching**', rotation only occurs when the inch controls are pressed and held in the on position. The beaker carrier Inching speed is limited to 5rpm.

If the drive system fails to detect rotation when rotation should be active, an alarm is displayed to indicate that the drive has been shut down (see 'Alarm Lists' in the Touch Screen Control System section). The heating system will also be shut down to protect against overheating. To reset the drive and heating system, open the chamber cover on the affected chamber, carefully clear the blockage and close it again. Reset the alarm and restart the profile.

Typically, the drive will shut down if:

1. A beaker has fallen out and mechanically blocked the carrier
2. The drive belt has failed causing loss of drive to the carrier
3. The motor has failed causing loss of drive to the carrier

3.1 Drive and Temperature Control Interlock

The chamber lid is interlocked to prevent continuous high-speed (45rpm) rotation of the beaker carrier and to interrupt the heating system when the chamber lid is open. The heating lamps generate extremely bright light during the generation of infrared heating.

The Inching Control is useful when loading or unloading beakers to and from the beaker carrier or when the 'Roaches Adchem' chemical dosing system is being used during the process.

The temperature control system will resume the profile when the chamber cover is closed if a temperature profile was running at the time it was opened.

DO NOT ATTEMPT TO DEFEAT THE LID INTERLOCK.

3.2 Misuse

NEVER attempt to remove a beaker from the beaker carrier whilst it is rotating – even when 'inching' the carrier.

NEVER fit tubes of mixed capacities on the beaker carrier, the different temperature response rates of the different tubes will cause bad results.

NEVER rotate the beaker carrier if the temperature sensor is fitted but not connected at either end.

ALWAYS observe safety guidelines when mixing chemicals that are being processed to avoid sudden and powerful chemical reactions within the vessels, particularly when making chemical additions.

4.0 CONTROLS

4.1 Dyeing Profile Controller

This is activated when the main isolator is switched on.
Refer to the section in this manual regarding the Control System.

5.0 THE BEAKER CARRIER AND BEAKERS

5.1 The Beaker carrier

The machine will be supplied with a beaker carrier allowing up to 16 beakers to be fitted in each chamber as standard. It is not necessary to change the beaker carrier to accept the different sizes of beakers that are available for the Pyrotec. Special carrier systems are available to accommodate vessels from 2 litres through 4 litres to a single 8 litre vessel. Full details of the beaker capacities are available on request.

If the beaker carrier is not fully loaded with beakers, balance the load evenly across the beaker carrier. This will reduce the load on the motor.

Ensure that for each size of beaker the machine is never run with less than half of the maximum capacity possible, as this may cause the thermal safety system to cut out prematurely.

E.g. for 'B1' size beakers, 8 or more should be fitted of the maximum possible 16 positions.

5.2 The Beakers

All the beakers are constructed in stainless steel grade 316.
All beakers have a strong screw cap with a cavity to prevent overfilling with liquor.

One beaker of each of the sizes available is used as the **CONTROL BEAKER** and is identified by the socket on the side of the beaker, which houses the temperature sensor (see photo). Additional information on the use and care of the Control Beaker is provided in section 6.4.

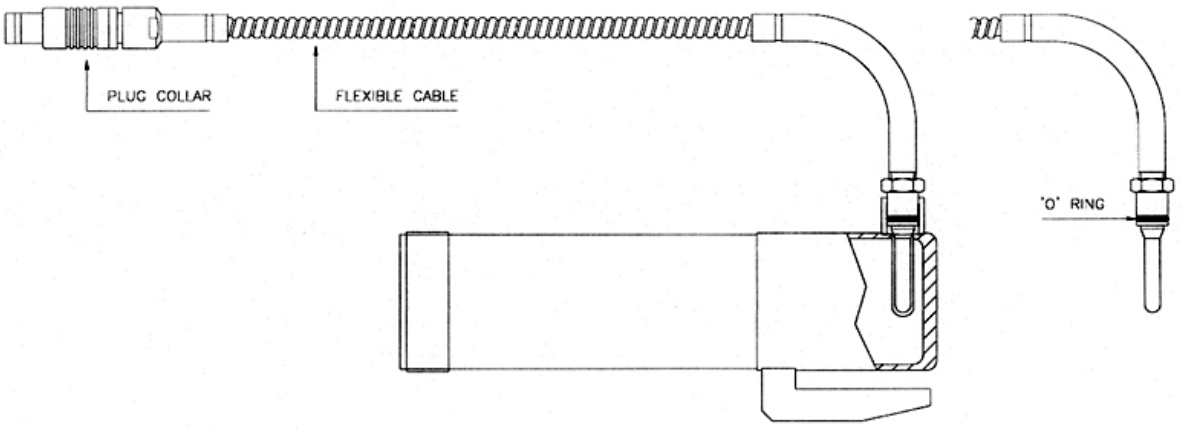
NEVER MIX BEAKERS OF DIFFERENT SIZES ON THE BEAKER CARRIER
THIS INCLUDES THE 'CONTROL BEAKER'.

5.3 Whilst every effort is made to ensure that the beakers are clean when despatched, we recommend that they are washed before use.

5.4 Probe Care

Care of the Temperature Sensor is vital to ensure that the temperature control system operates without fault. Following the simple guidelines below will ensure that the sensor remains in good condition for extended periods.

(i) Keep the connector dry – if it becomes wet, it will malfunction.
(ii) Do not use the flexible cable to remove the connector plug from the socket. Always use the collar on the plug to separate the connector.
(iii) Replace the 'O' Ring on the sensor body if it becomes damaged or loose.
(iv) Insert the sensor fully into the sensor pocket of the beaker.



6.0 OPERATION

6.1 Switch on the Power

Switch on the main electrical isolator and the cabinet ventilation fans will become active. The control system invokes an audible alarm test, which lasts for five seconds.

6.2 Thermal Protection System

The equipment is fitted with a heating output monitoring system to protect against process overheating situations and to inform of heating system faults.

6.2.1 Self Checking on Start Up

The heating system components are checked during the lamp test period when the power is switched on. **It is important that the chamber lids are closed before the power is switched on**. If a lid is open when the test takes place, the test will fail and cause an alarm.

6.2.2 Running Self Checks

When the process is running, the main components of the temperature control system are checked every 15 minutes. When this test occurs, the heating is cycled off then on again very quickly (when heating). This has no detrimental effect on the process. If the system detects a potential fault, the control system will generate an alarm.

If the heating output is detected for 60 minutes **continuously**, the heating monitor will interpret this as a fault and therefore will shut the system down and sound the alarm described above in 6.2.1.

6.2.3 Thermal Trips

In the unlikely event of the heating monitor failing, the thermal trip devices will cause the heater power to be disconnected.

In addition, the cabinet air temperature is monitored. The cabinet air temperature is kept to a minimum by expelling the warm air from the surroundings using a fan. If the fan should fail or become restricted, a thermal sensor detects this condition and an alarm is triggered on the PLC. The heating system is disabled when this occurs.

6.3 The Control Beaker

The process control is achieved from the result of temperature measurements within this beaker. The temperature sensor has a special connector to allow complete removal of the sensor with the beaker if necessary. Remember to connect the sensor to the socket on the centre hub of the carrier before attempting to run a profile. If the sensor is not fitted, the control system will generate an error message.

The Control Beaker is a useable process vessel in its own right and it should be remembered that the volume of liquor within the beaker would have a direct effect on the process temperature response (gradient). Always fill the beakers with equal volumes of liquor.

Always refresh the liquor in the Control Beaker to equalise the starting temperature before a new test is started. Failure to do this will result in temperature variations between the Control Beaker and the other beakers.

The Control Beaker can be fitted into any of the available positions of the carrier system using the method detailed in 6.4.

The temperature sensor plug must be connected to the hub socket, (push the plug in as far as it will go) **and to the Control Beaker**, (push the sensor in as far as it will go).

The temperature sensor can be disconnected from the Control Beaker before the Control Beaker is removed. The temperature sensor can normally be left connected to the hub socket, but if removal is required - **do not pull the cable**, the plug will only disengage by gripping the plug body. Care should be taken to ensure the bath is not rotated when the temperature sensor is not connected at both ends, as this will cause physical damage, which is outside the warranty conditions.

The connector must be kept clean and dry. The 'O' ring on the sensor body must be in good condition to prevent the sensor sliding out of the Control Beaker receptacle.

If it is suspected that the cable/plug of the temperature probe has become wet, dry the plug out before using it. Use compressed air to force the moisture out of the connector systems and leave in a warm, dry atmosphere for 24 hours.

N.B. Compressed air can be dangerous. Be aware of the hazards when using compressed air jets.

6.4 Loading the Beakers

For the conventional beakers and beaker carrier, beakers up to 1000ml can be used. For beakers whose capacity ranges from 2 litres to 8 litres, a special carrier is available which can easily be adapted for use in the Pyrotec chamber.

Conventional Carrier

Open the compartment lid. For the purpose of loading the beakers, which will have been filled with liquor and securely closed by this stage, rotate the beaker carrier by small amounts. When each beaker carrier is occupied with the required complement of beakers (see photo) close the chamber lid.

To load a beaker onto the beaker carrier; simply push the 'LOCATOR' into the 'LOCATOR TUBE' until the spring clip engages in the hole on the 'LOCATOR'.

To unload a beaker from the beaker carrier, lift the spring clip and withdraw the beaker.

Carriers for Larger Capacity Vessels

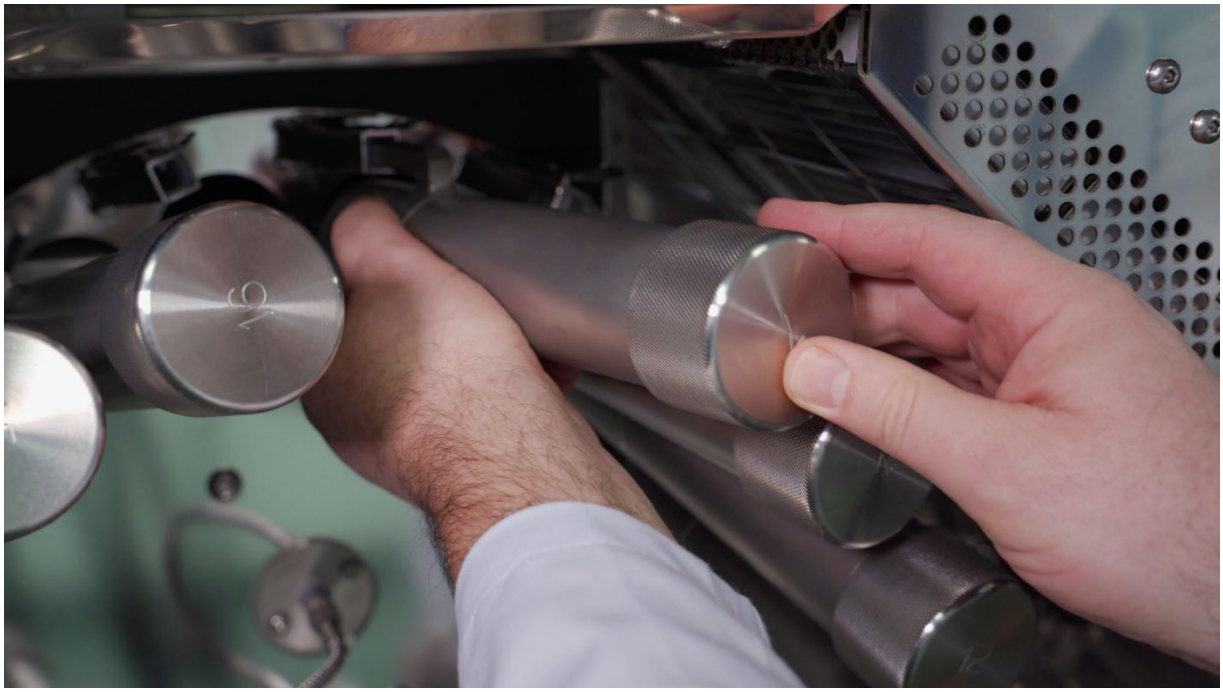
Carriers are available to allow two larger capacities of vessel to be used in the Pyrotec series of machines. The two carriers can accommodate either 2 x 4 litre vessels or a single 8 litre vessel accordingly. The photographs illustrate the different carrier types.

The larger beakers incorporate lifting handles so that they can be safely loaded and unloaded. The 8-litre vessel is the heaviest when filled and care should be taken when handling this vessel, particularly if it is hot after processing.

A special version of the **temperature sensor** is supplied for either of the larger vessel options. Do not use the 'standard' style sensor supplied with the Conventional Carrier (12 and 16 position). The temperature sensor is fitted in the larger capacity beakers in the same way as the smaller beakers, using the sensor pocket in the base of the vessel.

Both large capacity carriers are designed to be compatible with the Pyrotec drive shaft. Use the original M8 Cap Head Bolts and shake-proof washers when changing carriers. Tighten the bolts securely before loading the vessel.

6.5 The Beaker Compartment



The compartment has been designed incorporating a large aperture to allow full access to the beakers for loading/unloading and for use with the proven 'Roaches Adchem' system.

6.6 Running a Temperature Profile

If the Touch Screen Control System has been programmed with data such as gradient, temperature, time, close the compartment lid and then start the program sequence. (Refer to the Touch Screen Control System section).

6.7 Cooling Down Period

As part of the step sequence, allow a period of cooling so that the beakers are at a safe handling temperature prior to removal e.g. less than 50ºC (122ºF).

6.8 Attention Call Alarm

An audible alarm is provided which is linked to the control system and this will operate when an operator call has been programmed. This is convenient if the process requires operator intervention e.g. chemical addition during the process sequence. The audible alarm is supported by the relevant text based messages that can be programmed to identify the attention call functions within the profile.

6.9 Unloading the Beakers

At the end of the process sequence, open the compartment lid, 'INCH' the beaker carrier so that the beakers may be unloaded. The metal parts inside the chamber may remain hot for some time after the process has been stopped. Wear gloves to avoid burning your hands.

6.10 Isolate the Machine

Isolate the machine when it is not in use and turn off the cold water supply.

7.0 MAINTENANCE

Isolate and 'LOCK OFF' the power supply to the equipment prior to any maintenance operations, this protects the operator and the equipment.

At regular intervals and not exceeding 6 months, the following items should be inspected

1. Beaker locator and locator tubes - replace broken or weak springs. Replace the p.t.f.e sleeves if they are worn enough to allow the beakers to touch together.

2. Temperature sensor - do not use if the cable armour is damaged. Replace the 'O' ring retainer if the sensor does not grip in the receptacle.

3. Heating element and reflector - replace if not functioning or if it is damaged.

4. Touch Screen Backlight – replace it if it is not functioning or if the light output is low.

5. Ventilation fans and outlets - operational check - remove debris and dust build-up.

At regular intervals not exceeding 12 months, the following items should be inspected

1. Main bearings - lubricate with 'HIGH TEMPERATURE' grease (Molykote MS44 Silicone Grease)

2. Drive belt - check the tension, the belt should just be capable of being twisted through 90º using finger and thumb in the middle of the longest belt run.

3. Electrical connections - check security.

4. Drive pulleys and alignment - visual check.

7.1 HEATER UNIT REPLACEMENT

1. Remove the lid catch stay from the control panel cover Open the centre front panel (three screws below front edge)
2. Disconnect the heater cables from the heaters
3. Remove the wire heater guard from the inside of the process chamber. Unclip the element from the reflector and withdraw it
4. Route the element wires through the ptfe tube sleeves. Clip the heater carefully in position. **Avoid touching the quartz glass shroud with fingers.** If the glass is touched, it must be cleaned with methylated spirit before use.
5. Reconnect the element wiring
6. Re-fit the wire heater guard
7. Close and secure the centre cover.
8. Test the machine.

8.0 REPLACEMENT PARTS

The performance and efficiency of the equipment you are using can only be maintained if the operation and routine servicing program recommended in the instruction manual is adhered to.

Some components will eventually need to be replaced as part of the maintenance program.

Many parts are held in stock for a period of time to provide back up for older equipment, even if the part is obsolete, obsolescent or no longer fitted to the current equivalent machine. Occasionally however, it may not be possible to supply the part that was originally fitted. In this instance an equivalent part will be offered.

Replacement parts should be ordered from an authorised Roaches International appointed agent.

For best results and optimum performance:-

1..Service the machine in accordance with the recommendations of the manual.

2..Only use parts recommended by Roaches International.

ORDERING REPLACEMENT PARTS

To reduce delivery times, enter the following information on the purchase order:-

1..QUANTITY-State the number of items required.

2..ITEM DESCRIPTION -Where possible state the item code number and description.

3..MACHINE TYPE -e.g. Pyrotec S2, Washtec 2 tank etc.

4..SERIAL No. This is applied on the ‘data plate’ fixed to the machine back panel and is a four digit number suffixed with the year of manufacture e.g. 2040-95.

5..SUPPLY VOLTAGE -This information is specified on the ‘data plate’.

6..SUPPLY FREQUENCY -This information is specified on the ‘data plate’.