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# Corrosion Tester

**#120-700**

# Instruction Manual

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Ver. 2.0

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## Components

### #120-700-1 Spare Parts for One Year *(Individual components can be ordered separately.)*

- #120-001 Mineral Oil, 1 gal, Qty: 4
- #120-90-008 Circuit Breaker
- #120-700-011 Pressure Release Valve
- #120-700-012 Air to Cylinder Valve
- #120-700-016 Thermocouple Assembly, Qty: 2
- #120-700-018 O-ring, Qty: 6
- #120-700-020 Sample Jar, Qty: 12
- #120-700-021 Sample Jar Lid, Qty: 12
- #120-700-023 Heater, Qty: 2
- #122-052 Rupture Disk, 5,500 PSI (37.9 MPa), Qty: 4

## Specifications

- Maximum Temperature: 400°F (204.4°C)
- Maximum Pressure: 5,000 PSI (34.5 MPa)
- Sample Capacity: 4 Jars

# Setup

1. Carefully remove the instrument from the crate and place in a suitable location away from high traffic areas.

Make sure all valves are either closed or in the "Off" position.

2. Connect an air or nitrogen source (100 - 120 PSI) to the "Air Supply" port on the back of the instrument. Also connect the "Water Supply" and "Water Drain" ports.

All supply ports are ¼" female NPT connectors.

3. The "WASTE" port should be plumbed with the ¼" stainless steel tubing and the compression fitting that was supplied with the unit. The end of the ¼" tubing should be firmly attached to a waste container which is suitable for handling corrosive fluids.

Fluids that enter the waste container should never be reused. They will contain acids that may damage the pump and other important components.

4. Remove the cap from the oil reservoir. Fill the reservoir with white mineral oil. Use the sight glass located on the right side of cabinet to monitor the reservoir level. It should be filled to approximately ½" from the top of the sight glass.
5. Connect the control unit using the large cable supplied with the unit. The connector ports are located on the back of each cabinet. The connectors on both ends should be screwed together until they are firmly in place.
6. Attach the thermocouple cable to both units. The thermocouple connectors are located on the back of the control unit and on the top panel of the instrument.
7. Ensure that all electrical switches are off and plug the unit into a grounded electrical outlet. The electrical socket is located on the back of the unit. A 220-VAC, 20-amp power source is recommended.

# **Testing**

*Beginning a Test*

1. Before starting a test turn all electrical switches off and close all valves. Make sure the regulator on the front panel is turned fully counter-clockwise.
2. Prepare the acid solution and pour it into the sample bottles.
3. Add the corrosion inhibitor to the acid and mix.
4. Prepare the corrosion coupons and record the initial weight.
5. Turn the “Main” power switch on.
6. Remove the cap from the test cell and pour mineral oil into the cell until it comes to the top of the internal drive spindle located in the middle of the cell.
7. Use the up and down arrow keys on the temperature controller to adjust the set point temperature to 150°F.
8. Turn the “Heat” switch on to pre-heat the mineral oil to 150°F.
9. Once the mineral oil is heated to 150°F, add the coupons to the sample bottles and record the time.
10. Cap the sample bottles with the plastic screw caps. The caps have holes to allow pressure equilibrium.
11. Place the bottles into the sample rack and place the rack into the test cell using the lift bail. Remove the lift bail and record the time.



**Sample Rack with Bottles**

12. Lubricate the cell cap o-ring with bearing grease and screw the cell cap into the test cell.
13. Open the cell cap plug  $\frac{1}{2}$  turn. This will allow air to escape while the cell fills with mineral oil.



14. Turn the center valve to "Fill Cell". Air will force mineral oil from the reservoir into the test cell. When you see oil leaking from the cell cap plug, tighten it firmly with a  $\frac{9}{16}$ " wrench.
15. Turn the "Motor" switch on to activate the agitation system.
16. Turn the "Drive Coolant" valve on. The drive coolant keeps the magnetic drive system cool while the heaters are on.
17. Turn the "Pump" switch on. Apply pressure to the test cell by turning the regulator clockwise until you reach the desired pressure. Corrosion testing is commonly performed at  $2,500 \pm 500$  PSI.
18. Use the up and down arrow keys on the temperature controller to set the test temperature.

While heating the system, the pressure inside the test cell will increase due to thermal expansion. Maintain the proper test pressure by slowly opening the "Pressure Release" valve. Once the cell reaches the final test temperature, the pressure should stop increasing.

19. Start the test exactly five minutes after the mineral oil reaches the test temperature. Record the test time, temperature, and pressure at the start of the test.

# Testing

## Ending a Test

1. When the test is complete, turn the "Heat" switch off and set the temperature control to 32°F.
2. Turn the "Cool" switch on. Do not release the pressure until the test cell cools down to 180°F.
3. Once the cell is cool, turn the "Pump" switch off and turn the regulator completely counter clockwise. Slowly open the "Pressure Release" valve. The pressure gauge will return to zero.
4. Turn the "Motor" switch off.
5. Turn the "Drive Coolant" valve off.
6. Slowly turn the center valve to "Vent" and open the "Air to Cylinder" valve. Air pressure will force mineral oil from the test cell and out the "Waste" port. When you hear air discharging from the "Waste" port, close the "Air to Cylinder" valve.
7. Loosen the cell cap plug with a  $\frac{1}{16}$ " wrench.
8. Unscrew the cell cap from the test cell and remove the sample rack.
9. Remove the corrosion coupons from the sample bottles and neutralize them in sodium bicarbonate solution. Record the time the coupons are neutralized.
10. Wash the test cell with ammoniated water.
11. Remove excess fluid from the test cell with paper towels. Dry thoroughly.
12. Pour mineral oil into the cell until it comes to the top of the internal drive spindle located in the middle of the cell. Replace the cell cap to prevent foreign objects from entering the cell.
13. Clean and weigh the corrosion coupons. Inspect them for pitting and record the weight loss and metal condition.
14. Report the inhibitor performance as weight loss (mg) per time exposed.
15. Close all valves and turn all switches off.

# Appendix

## Temperature Controller

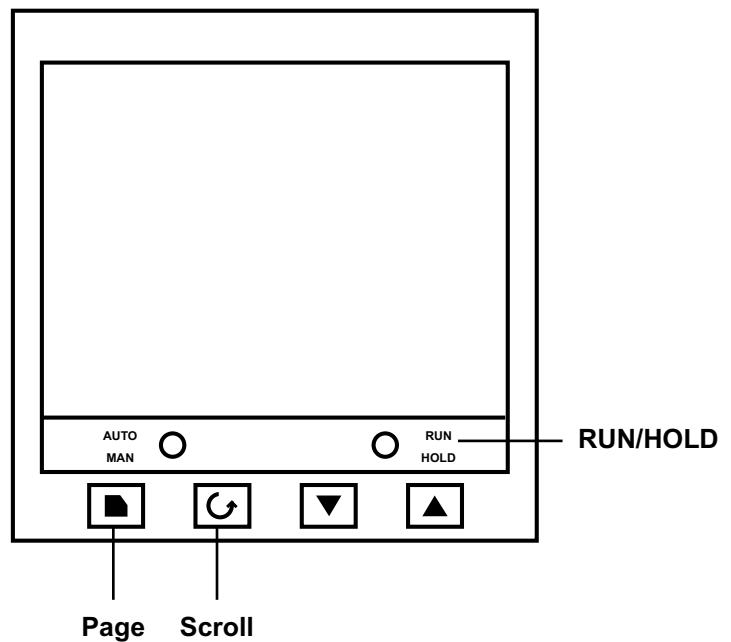
The Eurotherm Model 2404 Temperature Controller is the most important component of the temperature control system and it is strongly recommended that operators carefully study the Model 2404 instruction manual included with the Corrosion Tester.

If a test requires a custom program, it is important to build and save the program prior to creating the acid solution and loading the sample bottles.

Below is an example that illustrates how to program the controller. In this example, you want the test cell to heat to 350° in one hour and hold for four hours.

Press the “Page” button three times, and you will see “ProG List.” Use the “Scroll” button to decide which setting to change. Use the arrow buttons to change the values for that setting.

### Temperature Controller



For the test described on the previous page, you will want the following settings:

<u>ProG List</u>	<u>Setting</u>	<u>Explanation</u>
Segn	1	(segment 1)
Type	rmp.t	(ramp time - other choices include ramp rate and dwell)
Tgt	350	(final temperature)
Time	60	(reach target temperature in 60 minutes)
Segn	2	(segment 2)
Type	Dwell	(holds the temperature for the amount of time chosen for Dur below)
Dur	240	(duration time in minutes)
Segn	3	(segment 3)
Type	end	This is the last segment
End.t	sop	Stop the heat

To run the test, push and hold the “Run/Hold” button until the light for Run turns on. To stop the test, push and hold the “Run/Hold” button until the light for Run and Hold both turn off. **Be sure and turn the “HEAT” switch off as well.**

### **Temperature Controller Alarm**

The temperature controller utilizes a high alarm setpoint which will bring the unit to an alarm condition if the temperature ever exceeds this value. An alarm condition is evidenced by the flashing of "1FSH" in the display. In an alarm condition an audible alarm will sound (if the "Sonalert" switch is on), the "Alarm" switch will illuminate, the agitation system will stop, and the pump and heating systems will shut off.

If the thermocouple wire is disengaged an alarm condition will occur.

The high alarm set point is adjusted to 400°F at the factory. To adjust the high alarm setpoint perform the following.

1. Press the "Page" key four times. "ACCESS" will appear.
2. Press the scroll key once. "CODE" will appear.
3. Press the up arrow once. "1" will appear and change to "PASS".
4. Press the scroll key once. "GOTO-OPER" will appear.
5. Press the down arrow three times. "FULL" will appear, wait until it blinks.
6. Press the "PAGE" key six times. "AL-LIST" will appear.
7. Press the scroll key one time. "1FSH" will appear.
8. Use the up and down arrow keys to adjust the alarm setpoint to the required value.
9. Press the "PAGE" key nine times to return to the default display.

# Appendix

## Timer

The timer on the Corrosion Tester controls the auto-cool feature. The timer begins counting up as soon as the “R” button is pressed. When it reaches the first setpoint (P1), it turns on the cooling system to cool the cell. When it reaches the second setpoint (P2), it turns the cooling system off.

In order to safely use the auto-cool feature and timer, the temperature controller must be programmed with a ramp time, dwell time, and stop (refer to page 7 for help programming the temperature controller). This is to make sure the heaters are automatically turned off by the time the cooling system is turned on.

To do this, set the timer setpoint P1 to the total ramp and dwell time of the test. Then set P2 to P1 plus the total cooling time. In the example given on page 7, P1 would be set to 05:00 (one hour for ramp and four hours for dwell). Then, to cool for one hour, set P2 to 06:00 (five hours for ramp and dwell plus one hour for cooling).

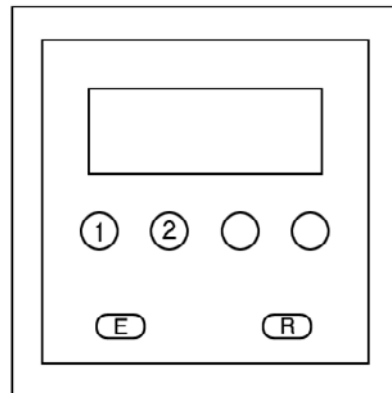
The temperature controller and the timer operate separately. In this example, the temperature controller turns on the heaters for five hours and then shuts them off. Meanwhile, the timer waits for five hours, then turns on the cooling system for one hour, then shuts it off.

To program the timer:

1. Press the “1” button to set P1.
2. Press the button below each digit to set that digit to the appropriate value. Each time you press the button, the digit will increase by one.

The display is in HH:MM format, meaning the first two digits indicate the number of hours and the last two indicate the number of minutes.

3. When the value is correct, press the “E” button.
4. Press the “2” button to set P2. Repeat steps 2 and 3 to set the value.



Timer Front Panel Layout

# **Appendix**

*Maintenance*

1. The most important maintenance procedure is cleaning. Be sure to thoroughly clean the test cell immediately after every test. High-pressure valves wear quickly when exposed to contaminated fluids containing particulate matter.
2. The test cell cap threads have been lubricated prior to shipment and periodically should be re-lubricated.