



*Dependable Products From People You Trust*



# HTHP Curing Chamber

**Single Cell, Single Deep: #120-20**

**Single Cell, Double Deep: #120-25**

**Dual Cell, Single Deep: #120-30**

## Instruction Manual

Updated 5/30/2023

Ver. 7

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## ***Intro***

The Model 200 HTHP Curing Chamber is utilized to prepare well cement specimens for compressive strength tests. It is necessary to determine the amount of time required for a cement to develop compressive strength so that drilling/production operations can be resumed as quickly as possible. The goal is to design a slurry that can quickly develop compressive strength so that the "waiting on cement" time may be minimized. The OFITE HTHP Curing Chambers provide a means of curing cement specimens under typical downhole temperatures and pressures.

## ***Description***

Cement is poured into a special mold that produces specimens measuring 2" x 2" x 2". The mold is placed into the test cell and the pressure is increased via an air-driven hydraulic pump. Test temperature is governed by a PID temperature controller, which actuates the heater. After a predetermined amount of time, the temperature of the test cell is reduced by the cooling system. Specimens are removed and the compressive strength is determined as outlined in API Specification 10.

## ***Components***

### **Components:**

|          |                                  |
|----------|----------------------------------|
| #122-001 | Thermocouple Assembly            |
| #122-008 | Heater Assembly                  |
| #122-052 | Rupture Disk, 5,500 PSI (38 MPa) |
| #122-073 | 2-Amp Fuse, 5 mm x 20 mm         |
| #122-077 | 10-Amp Fuse, 5 mm x 20 mm        |
| #122-079 | Circuit Breaker                  |
| #122-083 | Mold Assembly, 8 Specimen        |

### **Optional:**

#### **#120-21 Spare Parts for One Year's Operation 120-20:**

|            |  |
|------------|--|
| #122-001   | Thermocouple Assembly                        |
| #122-008   | Heater, Qty: 2                               |
| #122-052   | Rupture Disk, 5500 PSI (38 MPa), Qty: 2      |
| #122-073   | Fuse, 2 Amp, 5 mm x 20 mm, Qty: 4            |
| #122-074-1 | Fuse, 5 Amp, 5 mm x 20 mm, Qty: 4            |
| #122-077   | Fuse, 10 Amp, 5 mm x 20 mm, Qty: 4           |
| #122-079   | Circuit Breaker with Neutral Breaker, 25 Amp |

#### **#120-31 Spare Parts for One Year's Operation 120-30:**

|            |   |
|------------|---|
| #122-001   | Thermocouple Assembly, Qty: 4                       |
| #122-008   | Heater, Qty: 4                                      |
| #122-034   | Valve, Qty: 4                                       |
| #122-052   | Rupture Disk, 5,500 PSI (38 MPa), Qty: 4            |
| #122-072   | 1-Amp Fuse, 5 mm x 20 mm, Qty: 8                    |
| #122-074-1 | 5-Amp Fuse, 5 mm x 20 mm, Qty: 4                    |
| #122-079   | 25-Amp Circuit Breaker with Neutral Breaker, Qty: 2 |
| #122-083   | Mold Assembly, 8 Specimen, Qty: 2                   |

# Specifications

|                             |  |
|-----------------------------|--|
| <b>Air Supply</b>           | Not more than 150 PSI (1035 kPa)                       |
| <b>Cooling Water Supply</b> | 40 PSI (276 kPa)                                       |
| <b>Readout</b>              | Digital  |
| <b>Safety Features</b>      | Pressure Relief Valve<br>Safety Head with Rupture Disk |
| <b>Power Requirements</b>   | 220 Volts, 50/60 Hz, 25 Amp Electrical Power Supply    |
| <b>Weight</b>               | 499 kg   |
| <b>Dimensions</b>           | 84 × 76 × 152 cm                                       |
| <b>Shipping Weight</b>      | 590 kg   |
| <b>Shipping Dimensions</b>  | 99 × 91 × 168 cm                                       |
| <b>Industry Standards</b>   | API Specification 10<br>ASTM Standard C-109            |

## Maximum Temperature/Pressure Combinations Safety Factor: 2.0

| Temperature °F (°C) | Pressure PSI (kPa) |
|---------------------|--------------------|
| 72 (22)             | 5,750 (39,675)     |
| 85 (29)             | 5,600 (38,640)     |
| 125 (52)            | 5,250 (36,225)     |
| 190 (88)            | 4,800 (33,120)     |
| 260 (127)           | 4,400 (30,360)     |
| 375 (191)           | 4,000 (27,600)     |
| 550 (288)           | 3,600 (24,840)     |
| 650 (343)           | 3,400 (23,460)     |
| 746 (397)           | 3,275 (22,598)     |

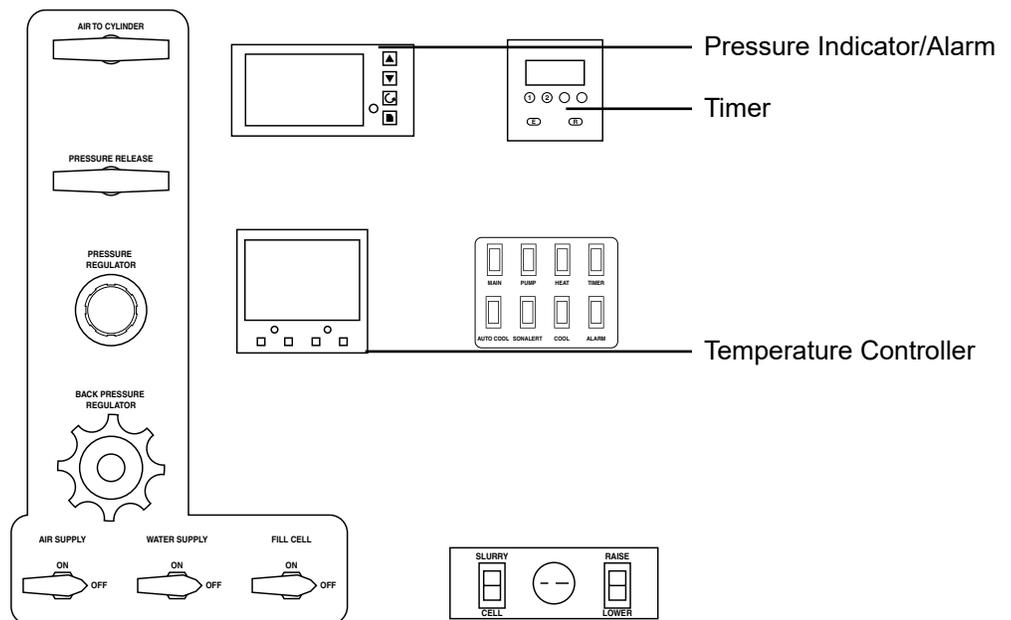
## Maximum Temperature / Pressure Combinations Safety Factor: 1.5

| Temperature °F (°C) | Pressure PSI (kPa) |
|---------------------|--------------------|
| 75 (24)             | 8,875 (61,193)     |
| 80 (27)             | 8,800 (60,676)     |
| 105 (41)            | 8,400 (57,918)     |
| 135 (57)            | 8,000 (55,160)     |
| 175 (79)            | 7,600 (52,402)     |
| 220 (104)           | 7,200 (49,644)     |
| 275 (135)           | 6,800 (46,886)     |
| 340 (171)           | 6,400 (44,128)     |
| 430 (221)           | 6,000 (41,370)     |
| 535 (279)           | 5,600 (38,612)     |
| 700 (371)           | 5,200 (35,854)     |
| 750 (399)           | 5,100 (35,164)     |

# Setup

1. Carefully remove the instrument from the wooden crate.
2. Ensure all five valves on the front of the instrument are closed. These valves are labeled “FILL CELL”, “AIR SUPPLY”, “WATER SUPPLY”, “AIR TO CYLINDER”, and “PRESSURE RELEASE”.
3. An air/nitrogen (690–1,035 kPa or 100–150 PSI) supply line should be connected to the “AIR SUPPLY” on the back of the instrument. The Curing Chamber is equipped with a ¼" (6.35mm) NPT fitting for connecting the air supply. The fitting is located on the back of the Curing Chamber at the very bottom.
4. The “DRAIN” and “WATER SUPPLY” lines should be connected in a similar manner. These ¼" hose connections are located right next to the air supply connection on the back of the unit.
5. Ensure that all electrical switches are in the off (down) position and make the necessary electrical connections in accordance to local codes. Ensure that the unit is grounded.
6. Turn the “MAIN” switch to the on position.
7. Prepare the cement molds as outlined on the next page. Note that these procedures are stated within API Specification 10.

## Curing Chamber Control Panel



## ***Prepare Molds***

Thinly coat the interior faces of the molds and the contact surfaces of the plates with grease to facilitate the removal of the cement specimens once they have cured.

## ***Prepare Slurry***

Prepare the cement slurry in accordance with Sect. 5 of API Specification 10.

## ***Fill Molds***

Place the slurry in the prepared molds in a layer equal to one-half of the mold depth. After all the specimen compartments are filled half full with slurry, puddle each specimen 25 times with a puddling rod. After puddling the first layer, stir the remaining slurry by hand using a puddling rod or spatula to eliminate segregation. Then fill each specimen to overflowing and puddle as the first layer. After puddling, strike off the excess slurry even with the top of the mold, using a straight-edge. Discard specimens in molds which show evidence of leaking. Place a greased cover plate on top of the mold. For one test determination, not less than three specimens should be used.



**Cement Molds**

# Operation

1. Loosen all twelve set screws on the cell cap with a torque wrench.
2. Unscrew the cell cap by turning it counter-clockwise.
3. Once the cell cap is completely unscrewed, flip the winch switch to "RAISE." The winch switch is located to the left of the cell on the Curing Chamber cabinet. The winch will automatically lift the cell cap off of the test cell.
4. Carefully lower the cement molds into the test cell, ensuring that the thermocouple port is centered correctly.
5. Remove the handle from the mold.
6. The sealing ring and threads on the cell cap should be lubricated periodically with a high temperature grease.
7. Flip the winch switch to "LOWER," helping align the cell cap as it is lowered to the test cell.
8. The test cell cap should be tightly screwed all the way into the test cell by hand, being careful not to damage the seal rings and the cap itself.
9. Tighten all the set screws on the cell cap by hand, using a circular sequence.
10. Adjust a torque wrench to 90 inch-pounds and tighten the set screws in a rotational sequence. In other words, tighten a set screw, skip four set screws, tighten the fifth set screw, skip four set screws, etc. until all of the set screws have been tightened. The torque wrench will click when the specific torque has been achieved.
11. Now adjust the torque wrench to 180 inch-pounds and tighten the set screws in the same rotational sequence as described above. In other words, tighten a set screw, skip four set screws, tighten the fifth set screw, skip four set screws, etc. until all of the set screws have been tightened. Again, be sure and listen for the click that signals the specific torque has been achieved.



It is imperative that the cap be tightened in a consistent and uniform manner to obtain a good seal.

12. Insert the thermocouple through the top of the test cell, tighten the threaded gland finger tight and then loosen  $\frac{1}{8}$  turn. Verify that the other thermocouple plug is connected to the side of the curing chamber cabinet.
13. Verify that the "AIR TO CYLINDER" and "PRESSURE RELEASE" valves are closed.

14. Turn the "WATER SUPPLY" valve on.
15. Turn the "AIR SUPPLY" valve on.
16. Turn the "FILL CELL" valve on. Water will flow into the test cell and air will be expelled from the loosened thermocouple connection.
17. With a  $\frac{5}{8}$ " wrench handy, watch the top of the cell. When water begins to flow from the thermocouple connection, tighten the thermocouple fitting with the wrench.
18. Apply pressure to the test cylinder by turning the "PUMP" switch on. The pressure may then be increased by turning the "REGULATOR" clockwise until the desired pressure is obtained. This pressure is shown on the "PRESSURE INDICATOR." The system will automatically make adjustments to keep the pressure consistent. The pressure threshold may be reduced by slightly opening the "BACK PRESSURE REGULATOR." See the Appendix for how to set up the alerts on the "PRESSURE INDICATOR."
19. The temperature can be controlled manually or by using a custom program. If temperature is being controlled manually, use the up/down arrows on the "TEMPERATURE CONTROLLER" to set the temperature. If a pre-set program is being used, follow the instructions on page 13 to start it. See the Appendix for how to custom program your "TEMPERATURE CONTROLLER."



Important

**The Back Pressure Regulator has a maximum operating temperature of 400°F. To test above that temperature, you must bypass the Back Pressure Regulator. Any excess pressure must be released manually with the Pressure Release valve. For more information see page 16.**

20. Turn on the "HEATER" switch.
21. Turn on the "SONALERT" so that you will be notified with beeping noises should the unit experience any alarms.
22. The timer on the OFITE Curing Chamber incorporates a relay which can be used to automatically control the water cooling solenoid. The timer may be activated by turning the "TIMER" switch and pressing the "R" button on the "TIMER". If a test requires the "AUTO COOL" feature, flip that switch on as well. See the Appendix for how to custom program the "TIMER."

# Termination



1. After the cement has cured for the required amount of time, the test will need to be terminated. If a custom program is running on the “TEMPERATURE CONTROLLER,” follow the instructions on page 13 to stop the program. If the temperature is being manually handled, use the down arrow key to reduce the temperature. In either case, the “HEAT” switch should be turned off.
2. If the “AUTO COOL” feature is not being used in conjunction with the “TIMER,” turn the “COOL” switch on.
3. After cooling to less than 80°C (180°F), release the pressure by switching the “PUMP” switch to the off position. Slowly open the “PRESSURE RELEASE” valve. The pressure gauge should be close to zero.

DO NOT RELEASE THE TEST PRESSURE UNTIL THE TEMPERATURE HAS BEEN REDUCED TO A MINIMUM OF 200°F.

4. With the “PRESSURE RELEASE” valve open, water can now be removed from the test cell. Slowly open the “AIR TO CYLINDER” valve. Air pressure will force water from the test cell. If air is escaping out of the vent, the “AIR TO CYLINDER” valve should be closed.
5. Slowly loosen the fitting on the thermocouple and remove it from the test cell.
6. The cap screws should be loosened and the test cell cap should be unscrewed. Use the winch switch to raise the cell cap. Remove the cement specimens and cool as stated within API Specification 10.
7. Return the test cell cap to the test cell to prevent dust and other matter from entering the test cell. Close all valves and return all switches to the off position.

## Maintenance

1. One of the most important elements of trouble free operation is keeping the interior of the test cell as clean as possible. Never insert a cement covered cement mold into the test cell and periodically examine the test cell to ensure that it is clean. High pressure valves wear quickly when exposed to fluids containing cement and other particulate matter. Also make sure the air used for the air supply is clear.
2. OFITE uses a high pressure filter to protect valve stems. It is recommended that filtered water be used in the curing chamber to prevent particulate matter from entering the pump and possibly causing damage. Clean or replace these filters when fluid flow is reduced from that of a clean system. Remember: Filters are inexpensive when compared to the costs of replacing the components they were designed to protect.
3. The test cell cap threads have been lubricated prior to shipment and periodically should be re-lubricated.

## Troubleshoot

The OFITE Curing Chamber utilizes several fuses that are integral to the unit's proper functioning. Located on the left side of the Curing Chamber cabinet, these should be checked periodically and whenever you are experiencing problems with the Curing Chamber.

1. Main Circuit Breaker - Check if there are any problems with power to the unit.
2. Heater Circuit Breaker - Check if the unit's heaters are not functioning.
3. F4, F5, F6, F7 Fuses - A light indicates when they need to be replaced.

The OFITE Curing Chamber also contains a built in test you can perform to make sure the "PRESSURE INDICATOR/ALARM" is functioning properly. To perform this test, press in the white plastic key located on the far right. The unit should beep and the entire "PRESSURE INDICATOR/ALARM" panel should light up in a circular motion.



F4-F7 Fuses

Main Circuit Breaker

Pressure Indicator/Alarm Key

Heater Circuit Breaker

# **Appendix**

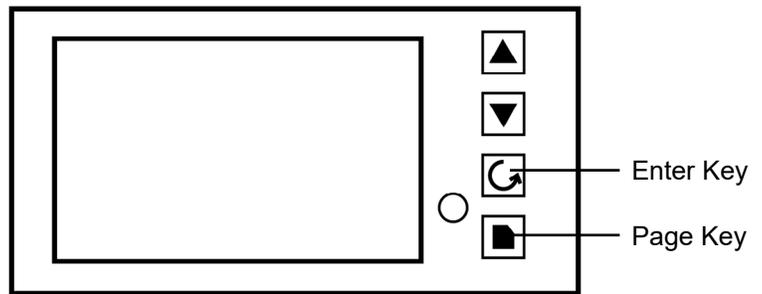
## *Pressure Indicator*

The pressure indicator not only indicates the current pressure, but it also alerts when the pressure rises above a programmed value.

The display shows the current pressure in KPSI. This means a reading of 12.501 indicates a pressure of 12,501 PSI.

To set the high-pressure alarm:

1. Press the “Page” button until the display reads “AL”.
2. Press the “Enter” button until the display reads “1FSH”.
3. Press the up and down arrows to set the high-pressure setpoint.



Pressure Indicator

# Appendix

## Set Temperature



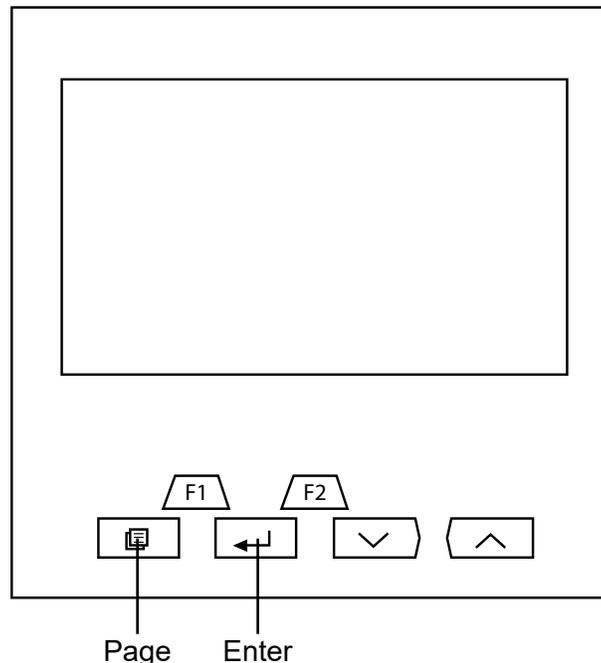
The Eurotherm Model EPC3004 Temperature Controller is the most important component of the temperature control system and it is strongly recommended that operators carefully study the Model EPC3004 instruction manual included with the Curing Chamber.

If a test requires a custom program, it is important to build and save the program prior to creating the slurry and loading the molds.

Below is an example that illustrates how to program the controller. In this example, the target temperature is 150°C, which is obtained at a rate of 2.5 degrees per minute. The target temperature of 150°C is maintained for the duration of 180 minutes (3 hours), after which you want to stop the heat.

Before you can create a program, you must be in Operator Level 2.

1. Press and hold the Page button until LEV1 shows.
2. Press the Up Arrow button until LEV2 shows.
3. Press the Enter button.
4. Press the Enter button three more times to scroll to the last digit of the password.
5. Press the Up and Down Arrow buttons to set the password to “2”.
6. Press the Enter button (the display will show LEV2 PASS) to return to the home screen.



For the test described on the previous page, use the following settings Use the Enter button to decide which setting to change. Use the Arrow buttons to change the values for that setting.

1. Press the Page button until P.SET is displayed. If you don't see P.SET, you will need to enter the password again.
2. Press the Enter button.
3. Press the Up and Down Arrow buttons to select a program number (1-10).
4. Press the Enter button twice. HB.STY will be displayed.
5. Use the Up and Down Arrow buttons to select PROG.
6. Press the Enter button. HB.TYP will be displayed
7. Use the Up and Down Arrow buttons to select LOw.
8. Press the Enter button. HB.VAL will be displayed.
9. Use the Up and Down Arrow buttons to select 10.0.
10. Press the Enter button. RAMP.U will be displayed.
11. Use the Up and Down Arrow buttons to select P.MIN.
12. Press the Enter button. DWEL.U will be displayed.
13. Use the Up and Down Arrow buttons to select M.INS. This will set the Dwell units to Minutes. You can also choose Hours and Seconds.
14. Press the Enter button. P.CYC will be displayed.
15. Use the Up and Down Arrow buttons to select 1.
16. Press the Enter button. P.END will be displayed.
17. Use the Up and Down Arrows to select dwEL.
18. Press the Enter button. S.NUM will be displayed.
19. Use the Up and Down Arrow buttons to select 1.
20. Press the Enter button twice. S.TYPE will be displayed.
21. Use the Up and Down Arrow buttons to select RATE.
22. Press the Enter button. TSP will be displayed.

23. Use the Up and Down Arrow buttons to select 150.
24. Press the Enter button. R.RATE will be displayed.
25. Use the Up and Down Arrow buttons to select 2.5.
26. Press the Enter button twice. S.NUM will be displayed.
27. Use the Up and Down Arrow buttons to select 2.
28. Press the Enter button twice. S.TYPE will be displayed.
29. Use the Up and Down Arrows to select dWELL.
30. Press the Enter button. DUR will be displayed.
31. Use the Up and Down Arrows to select the time (HH:MM).
32. Press the Enter button twice. S.NUM will be displayed.
33. Use the Up and Down Arrow buttons to select 3.
34. Press the Enter button twice. S.TYPE will be displayed.
35. Use the Up and Down Arrow buttons to select ENd.
36. Press the Page button until the display returns to the main screen.

Once the program is entered, do the following to run it:

1. Press the Page button until PROG is displayed.
2. Press the Enter button to select the program number.
3. Press the Enter button until you see P.MODE.
4. Press the Up and Down Arrow buttons to select RuN.

To stop a program, you must be in Operator Level 2. See page 11. Then to the following:

1. Press the Page button until PROG is displayed.
2. Press the Enter button to select the program number.
3. Press the Enter button until you see P.MODE.
4. Press the Up and Down Arrow buttons to select rSET.
5. Press the Page button until the display returns to the main menu.

The status of the program is shown by the program status indicator.

| State                | Ramp/Step Up                              | Dwell                                     | Ramp/Step Down                            |
|----------------------|---|---|---|
| Reset                | Blank                                     | Blank                                     | Blank                                     |
| Run                  | /   | —   | \   |
| Hold/Holdback        | /   | —   | \   |
|                      | Flashing (1 second period 66% duty cycle) | Flashing (1 second period 66% duty cycle) | Flashing (1 second period 66% duty cycle) |
| Complete (Dwell End) | N/A                                       | —<br>Flashing (2 seconds 66% duty cycle)  | N/A                                       |

The temperature controller utilizes a high alarm setpoint which will bring the unit to an alarm condition if the temperature ever exceeds the set value. This value is defaulted to 200°C or 400°F, but can be programmed to different values.

An alarm condition will also occur if the slurry thermocouple is unplugged.

When a alarm condition occurs, the Curing Chamber will start to beep if the “SONALERT” switch is turned on and the “ALARM” switch will light up red. The heat and pump will be turned off. After the alarm condition is over, everything will be turned back on.

# Appendix

## Set Timer

The OFITE Curing Chamber incorporates a timer for auto-cooling. The timer may be activated by turning the “TIMER” switch to the on position.

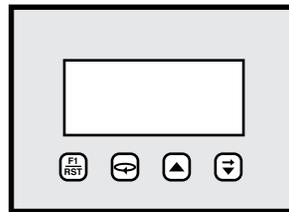
As an example, suppose the temperature is ramping up to 350°F in one hour and maintaining for four hours. After the test, allow it to cool for two hours.

1. Press the  key to select setpoint 1. The setpoint number is in the bottom left-hand corner of the display.
2. Press the up and down arrows to set the setpoint. Remember to set the timer for the number of minutes. In this example, set it to 300 (equivalent to 5 hours).
3. Press the  key to select setpoint 2.
4. Press the up and down arrows to set the setpoint. Remember to set the timer for the **total** number of minutes for the test. In this example, set it to 420 (5 hours of heating plus 2 hours of cooling).
5. Press the  key again to return to the home screen.
6. Press the F1/RST button to start the timer. Make sure the “AUTO COOL” switch is in the “ON” position. After 5 hours the water solenoid will engage and begin cooling the unit. The unit will cool for 2 hours and then the solenoid would de-activate.



Note

While running, the timer counts in minutes. It may not immediately appear to be working. But after one minute, the readout will advance to 2.



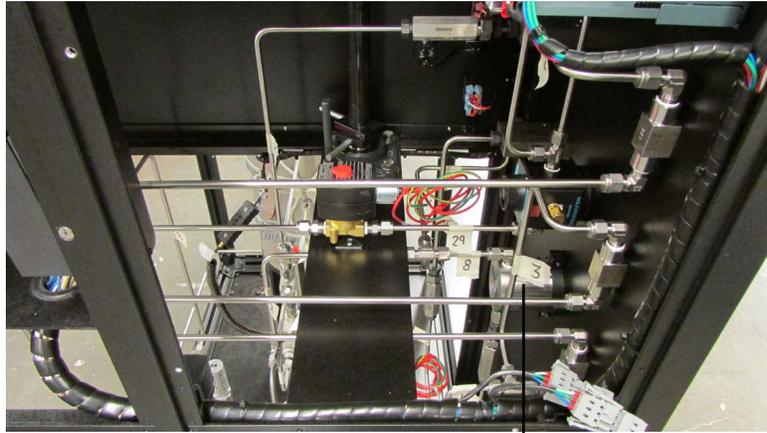
Timer Front Panel Layout

# Appendix

## BPR Bypass

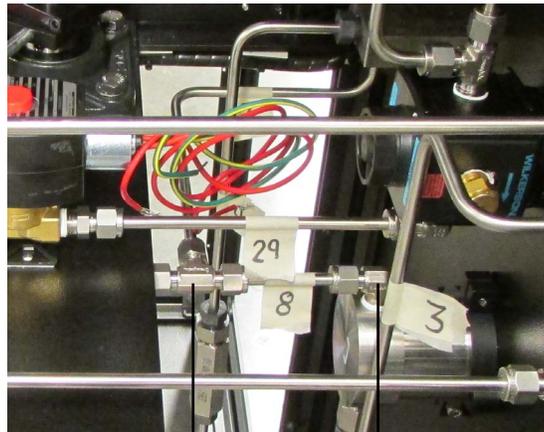
For tests above 400°F, it is necessary to bypass the Back Pressure Regulator to avoid damaging it. When this is done, the equipment can be used to test at higher temperatures, but excess pressure must be released manually with the Pressure Release Valve.

1. Remove the side panels to access the plumbing.
2. Locate the back pressure regulator.



Back Pressure Regulator

3. Remove the tubing from the outlet port on the back pressure regulator to the low-pressure tee.



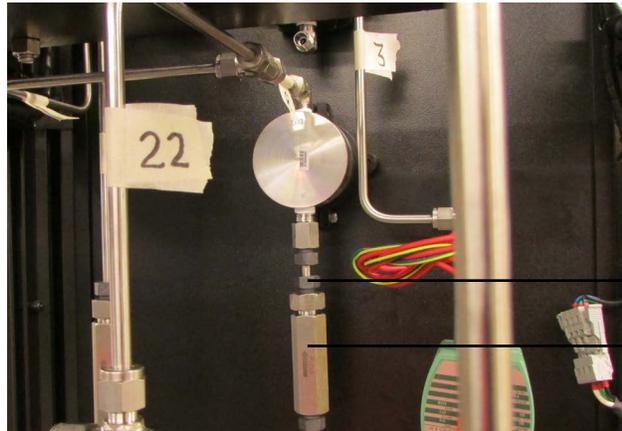
Low-Pressure Tee

Outlet

4. Locate the glang (#700-100-021) and plug (#700-100-037).



5. Install the gland and plug on the outlet port of the high-pressure filter.

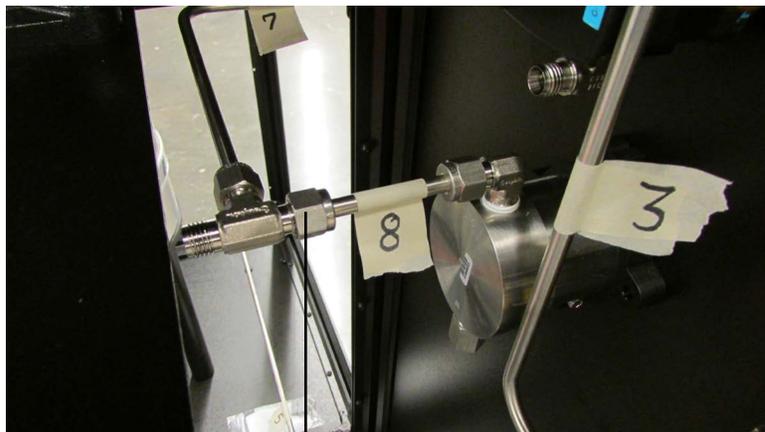


Gland and Plug  
High Pressure Filter

6. Locate the Swaglock plug (#120-910-071).



7. Install the plug on the now open port of the low pressure tee that was connected to the back pressure regulator.



Install Plug Here

# Warranty and Return Policy

## Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

## Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.  
Attn: Repair Department  
11302 Steeplecrest Dr.  
Houston, TX 77065  
USA

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