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Stirred Fluid Loss Tester

120-70 (115 Volt)
120-70-1 (230 Volt)

Instruction Manual

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Ver. 12

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Intro

Successfully cementing the casing string of an oil or gas well is highly dependent upon the characteristics of the cement slurry. Properties that should be considered include consistency, density, the ability to quickly develop compressive strength, rheological properties, and filtration control. Well cements that have poor filtration control can lead to a complete failure of the cementing operation. In addition, the invasion of filtrates into producing zones causes formation damage, which can greatly reduce the production potential of the reservoir. Developing cement slurries that have minimal filtration loss prevents expensive remedial cementing operations and reduces formation damage. The OFITE Stirred Fluid Loss Tester provides a reliable means of determining the fluid loss characteristics of a well cement.

Overview

A cement slurry is poured into the test cell, which is then placed into the heating jacket. The gear drive system is connected to the agitation paddle, which is dimensionally equivalent to an atmospheric consistometer paddle. The desired test temperature is maintained by a digital PID temperature controller, while the necessary pressure is applied to the cell to prevent evaporation of the liquid phase. When conditioning the cement in accordance to API (American Petroleum Institute) Specification 10 guidelines, the paddle is rotated at 150 rpm for 30 minutes. Once the cement is conditioned, differential pressure is applied to the cell. The filtrate is collected in a back pressure receiver for 30 minutes. The API defines fluid loss as the volume (ccs) of filtrate that is collected during this 30-minute interval.

Components

Consumables:

#120-70-025	Flexiseal
#120-70-033	PTFE Sleeve Bearing
#120-70-033-1	Bearing, Antimony Carbon, Qty 3
#120-70-1-026	Paddle Assembly
#120-503	Paddle Pin
#130-81-090	Loctite, Qty 3
#165-44	High-Temperature Thread Lubricant, 1 oz
#170-13-3	Test Cell O-ring, Viton 90D
#170-17	Valve Stem O-ring, Viton 90D
#170-18	Detachable Screen, 325 Mesh with 60 Mesh Backup
#171-11	O-ring for Backpressure Receiver

Replaceable Parts:

#120-70-1-020	Backpressure Receiver
#120-70-1-021	Gauge, 1,000 psi
#120-70-1-022	Gauge, 4,000 psi
#120-70-1-049	Spanner Wrench
#120-70-1-062	Test Cell
#120-70-1-064	Cell Cap, Filter Side
#120-70-024	Cell Cap, Drive Side, With Paddle
#120-80-6	Motor
#130-76-03	Thermocouple
#150-86-040	Temperature Controller
#152-37	AC Power Cord, (115 Volt Only)
#152-38	AC Power Cord, (230 Volt Only)
#153-14	Graduated Cylinder, 50 mL × 1 mL, Glass
#153-16	Graduated Cylinder, 25 mL × ⅒ mL, Glass
#165-14-8	Type “J” Thermocouple, ⅛" × 6"
#170-16	Valve Stem, 3.25" (8.3 cm)
#170-35	6" Adjustable Wrench
#171-23-1	Safety Pin with Lanyard

115 Volt Fuses:

#121-017	Heater Fuse, 8 Amp
#130-10-503	Motor Fuse, 4 Amp
#172-09	Main Fuse, 10 Amp

230 Volt Fuses:

#121-017	Main Fuse, 8 Amp
#130-10-503	Heater Fuse, 4 Amp
#172-05	Motor Fuse, 2 Amp

Optional:

#120-71 One Year's Spare Parts for Stirred Fluid Loss Tester

#120-70-025	Flexiseal, Qty: 4
#120-70-033-1	Bearing, Antimony Carbon, Qty: 4
#130-76-03	Thermocouple, Qty: 2
#153-16	Graduated Cylinder, 25 mL × ⅒ mL, Glass, Qty: 4
#170-16	Valve Stem, 3.25" (8.3 cm), Qty: 6
#170-18	Detachable Screen, 325 Mesh with 60 Mesh Backup, Qty: 12
#171-11	O-ring for Backpressure Receiver, 100 mL, Qty: 12
#171-23-1	Safety Pin with Lanyard, Qty: 2
#170-17	Valve Stem O-ring, Viton 90D, Qty: 50
#170-13-3	Test Cell O-ring, Viton 90D, Qty: 50

Specifications

- Maximum Pressure: 2,000 psi
- Maximum Temperature: 450°F (232.2°C)
- Temperature is maintained by a PID temperature controller
- Variable paddle rotation speed (5 to 200 rpm)
- Filtration portion of cell is dimensionally equivalent to an API approved HTHP test cell

Setup

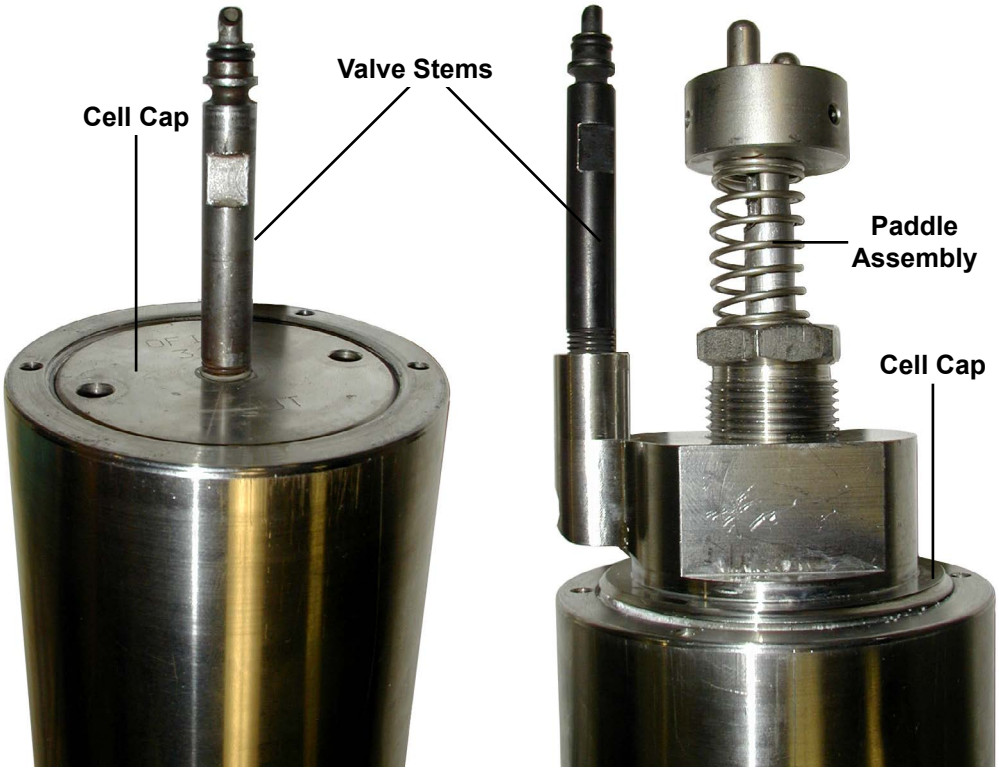
1. Connect the instrument to a power source. Be sure to use the correct voltage for your equipment.
2. Connect the instrument to a nitrogen source using the connector on the back panel. The nitrogen source should be regulated between 2,000 and 2,500 psi.
3. Connect a drain and water supply to the back of the unit. All connectors are ¼" NPT.

Operation

Preparing the Test Cell

1. Begin by turning the test cell so that the end labeled "In" is facing up.
2. Apply high-temperature grease (#165-44) to a cell cap o-ring (#170-13-3) and insert it into the groove inside the test cell.
3. To facilitate cleaning, a thin coat of white lithium high-temperature grease may be applied to all surfaces that will come in contact with cement. This includes the inside of the test cell, the paddle, and the inside surfaces of the two cell caps.
4. Lubricate the threads on the paddle assembly cell cap. Press the poppet valve into the closed position and insert the paddle into the test cell. Hand tighten completely.
5. Screw the valve stem (#170-16) into the paddle assembly cell cap and tighten it completely.
6. Turn the cell over. If possible, place the cell in a vise to prevent damage to the valve stem.
7. Mix your cement slurry as directed in API Specification 10 and pour no more than 425 mL into the test cell. Remove any cement from the o-ring groove.
8. Apply high-temperature grease to another cell cap o-ring (#170-13-3) and place it in the groove inside the end of the test cell.

Cement Screen



Screen-Side Cell Cap **Paddle-Side Cell Cap**

9. Place the Cement Screen (#170-18) into the test cell on top of the o-ring with the flat side facing down.

10. Apply high-temperature grease to another cell cap o-ring (#170-13-3). Then, place the o-ring into the end of the cell, on top of the cement screen.

11. Lubricate the threads of the cell cap with an anti-thread galling compound and screw the cap into the cell with the spanner wrench provided. Tighten the cap completely.

12. Screw the valve stem (#170-16) into the center of the screen-side cell cap and tighten completely.

Operation

Installing the Test Cell

1. Rotate the heating jacket until it is horizontal. The fully-open end should be facing away from the control panel.

2. Insert the test cell into the heating jacket, paddle assembly first.

3. Return the heating jacket to the vertical position and insert the cell holder to secure the test cell.

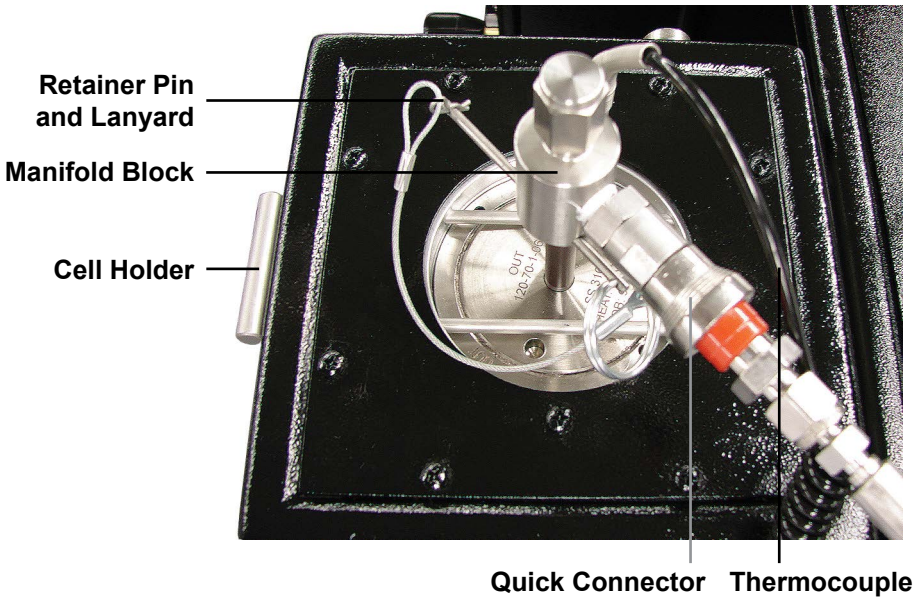
4. Connect the longest stainless steel hose from the Coolant Out port on the cabinet to the corresponding port on the heating jacket. This will allow steam to vent as water in the cooling coils evaporates when the cell heats up.

5. Connect the end of the paddle assembly to the motor below the heating jacket.

6. Attach the manifold block (#170-20) to the upper valve stem and secure it with the retaining pin (#171-23-1).

7. Connect the upper air line to the manifold block using the quick connect attachment.

8. Loosen the upper valve stem one half turn.



Test Cell in Heating Jacket

Operation

Performing the Test

In this sections, the numbers in () refer to components identified in the “Control Panel” image at the bottom of this page.

1. Begin by turning the ‘Main’ switch (3) on.

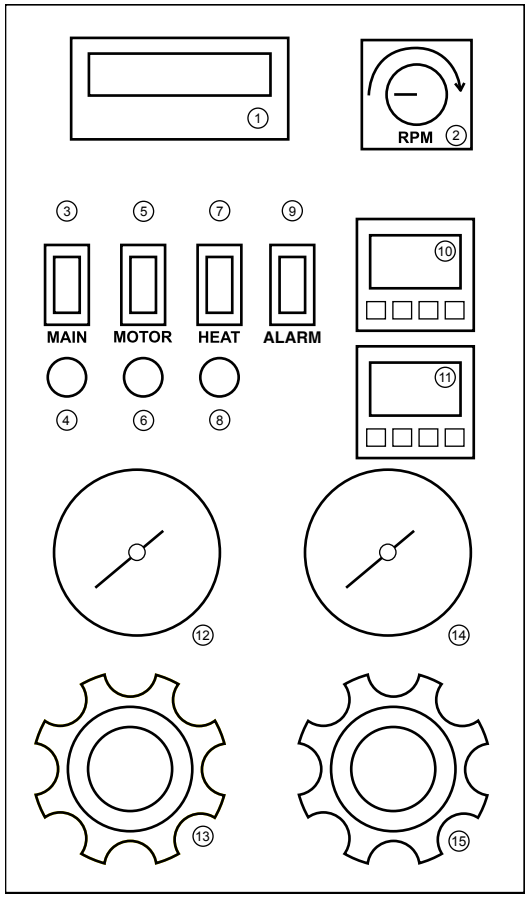
2. Turn on the switch labeled ‘Motor’ (5) and accelerate the motor to 150 rpm using the potentiometer (2).

   The motor requires some time to reach the specified speed. After turning the potentiometer, wait a few seconds before turning it again to allow the motor to fully accelerate.

3. Increase the high-end pressure (13) to 500 psi by rotating the left-hand regulator clockwise.

4. Make sure the thermocouple is plugged into the thermocouple port on the unit cabinet. Insert the thermocouple into the hole on the top of the test cell.

Tip

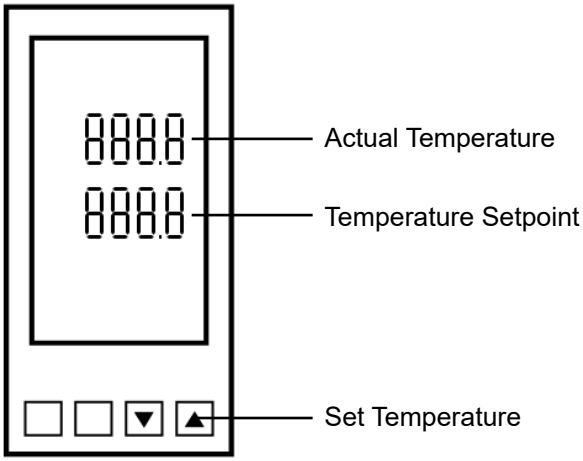


1. Motor Speed Indicator (rpm)
2. Potentiometer
3. Main Power Switch
4. Main Fuse
5. Motor Power Switch
6. Motor Fuse
7. Heat Power Switch
8. Heat Fuse
9. Alarm Power Switch
10. Temperature Controller
11. Timer
12. High-End Pressure Gauge (psi)
13. High-End Pressure Regulator (#120-70-1-050)
14. Low-End Pressure Gauge (psi)
15. Low-End Pressure Regulator (#120-70-1-051)

Control Panel

Important

The thermocouple MUST be properly inserted into the hole in the test cell and plugged into the port BEFORE the heat is activated.



Temperature Controller

5. Set the temperature controller to the desired setting and turn the ‘Heat’ switch (7) on.

6. Once the test cell reaches the desired temperature, condition the cement for another 30 minutes. Then turn off the ‘Motor’ switch (5).

Note

If you notice a leak from the bottom end of the test cell, lower the pressure and tighten the packing nut on the paddle.

7. Close the upper valve stem by tightening it all the way. Then, lower the high-end pressure (13) down to 0 psi.

8. Remove the manifold block from the upper valve stem and disengage the motor from the paddle assembly.

9. Pull the retaining pin knob and turn it a few degrees. Rotate the heat jacket 180° so that the paddle assembly is now on top. Now rotate the retaining knob back to its original position to lock the heat jacket into place.

10. Attach the manifold block to the valve stem on the paddle assembly and secure it with the retaining pin.

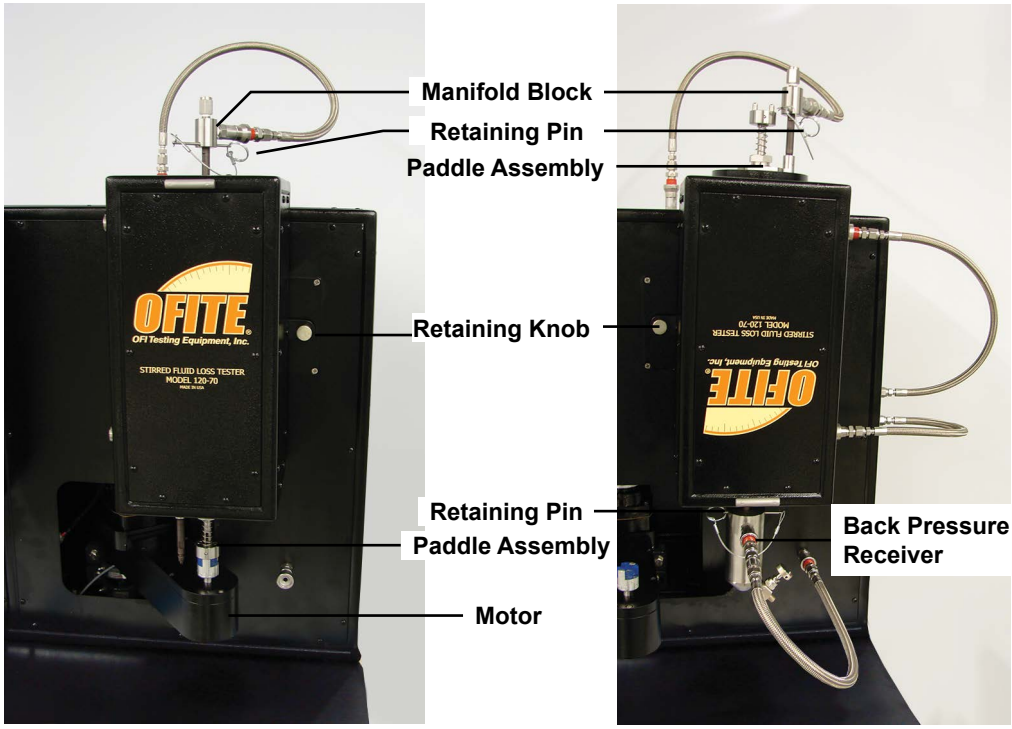
11. Attach the back pressure receiver to the lower valve stem and secure it with the retaining pin.

12. Connect the lower air line to the back pressure receiver using the quick connect attachment.

13. Based on the temperature of your project, refer to the chart on the next page to determine the water vapor pressure inside the test cell. Set the high-end pressure (13) to this value plus 1,000 psi.

Temperature °C / °F	Water Vapor Pressure kPa / psi	Coefficient of Volume Expansion of Water
100 / 212	100 / 14.7	1.04
121 / 250	210 / 30	1.06
149 / 300	460 / 67	1.09
177 / 350	930 / 135	1.12
204 / 400	1,700 / 247	1.16
232 / 450	2,910 / 422	1.21
260 / 500	4,688 / 680	1.27
288 / 550	7,200 / 1,044	1.36
316 / 600	10,620 / 1,541	1.47

Heating Jacket Orientation



Conditioning the Cement **Performing the Test**

15. Loosen the upper valve stem one half turn.

16. Set the low-end pressure (15) to the appropriate pressure based on API Specification 10 by rotating the right-hand regulator clockwise.

17. Loosen the lower valve stem one half turn. Begin timing for 30 minutes.

It is important to begin timing as soon as you open the lower valve stem. The results of your test are determined by the amount of fluid collected during this 30-minute period.

Important

18. Open the release valve on the back pressure receiver and collect the resulting fluid in the graduated cylinder. When you hear air instead of liquid, close the valve. Repeat this step every few minutes for 30 minutes.

19. After 30 minutes, close both valve stems, reduce both pressure settings to 0 psi, turn off the 'Heat' switch (7), and reduce the temperature setting.

20. Record the volume of the filtrated collected. Multiply that value by two to determine the fluid loss.

21. Connect the stainless steel hose from the Coolant Out port on the cabinet to the corresponding port on the heating jacket. Connect the other hose from the Coolant In port on the cabinet to the corresponding port on the heating jacket.

Tip

To prevent spills, always connect the Coolant Out ports before connecting the Coolant In ports.

22. Once the cell has cooled, release the pressure by slowly opening the valve stem on the paddle assembly.

Important

Always release the pressure **very slowly** to avoid pulling cement into the plumbing.

23. Disassemble the test cell and clean all of the components thoroughly. Press the poppet valve back into the closed position.

Important

Be sure to clean the test cell, paddle assembly, and all other components immediately to prevent the cement from hardening and damaging the equipment.

24. After each test, purge the remaining water from the cooling coils.

    a. Run the quick-connect hose from the upper air line to the Coolant In port on the heating jacket.

    b. Leave the Coolant Out line connected.

Important

    c. Turn the High-End Pressure Regulator clockwise slightly to add pressure to the cooling coils.

    d. After a few minutes, back off the pressure regulator and disconnect the upper air line.

Maintenance

If fluid is leaking from the paddle-assembly end of the test cell, it may be necessary to disassemble the paddle assembly and inspect the various parts for wear. Refer to the diagram on page 15.

1. Examine the o-rings on the cell cap and the valve stems. If any of these o-rings are worn or damaged, replace them and try the test again. If the leak continues, proceed to step 2.

2. Pull the collar down on the spring and remove the paddle pin that secures it to the drive shaft.

3. Unscrew and remove the retainer nut in the center of the paddle assembly cell cap.

4. Remove the paddle assembly, bearing, and flexiseal.

5. Examine the flexiseal for wear or damage.

6. If the flexiseal is worn or damaged, replace it with a new one. Make sure the spring it pointed down toward the paddle assembly.

7. Reinsert the paddle shaft into the cell cap.

8. Screw the retainer nut back into place in the cell cap.

9. Slide the spring onto the drive shaft, followed by the collar.

10. Pull the collar down onto the spring and reinsert the paddle pin that secures it to the drive shaft.

Note

The paddle is held onto the drive shaft with a small paddle pin. If the cement inside the test cell begins to harden while the motor is engaged, this pin is designed to break, allowing the motor to continue turning without damaging any expensive parts. If this happens, it will be necessary to replace the pin before continuing usage.

1. Remove any remaining pieces of the broken pin.

2. Reinsert the drive shaft into the paddle assembly and align the holes on both.

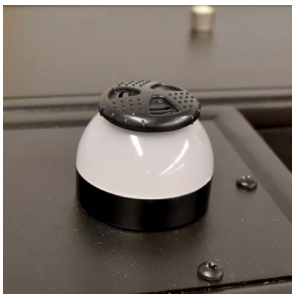
3. Insert the new paddle pin into the hole to secure the paddle to the drive shaft.

Timer

The Stirred Fluid Loss Tester features an integrated timer with an audio/visual alarm. The timer is automatically on when the main power is turned on.

During Testing

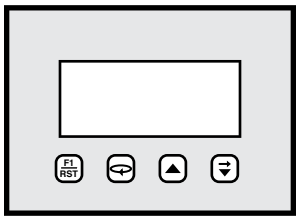
1. Turn the Alarm swtich to ON.
2. To restart the timer, press the F1/RST button. The timer will begin counting up.
3. When the timer reaches the setpoint, the alarm will sound and the alarm indicator will turn red.
4. To adjust the volume, twist the top of the light.



5. Turn the Alarm switch to OFF to stop the alarm and turn off the light.

Setting the Test Duration

1. Press the ▲ or ▼ button.
2. Press the ▼ button to select the digit you want to edit.
3. Press the ▲ button to change the digit.
4. Press the ↔ button or wait for 10 seconds to the save the new setpoint.



Timer Front Panel Layout

After a test is finished, the paddle assembly cell cap may be very difficult to unscrew. This is due to extra pressure within the cell that is yet to be released. To solve this problem, release the pressure inside the test cell.

1. Remove both valve stems from the cell caps.

2. Using a small, pointed object, dislodge any material that may be blocking the openings beneath the valve stems.

3. Unscrew the poppet valve with the included tool and dislodge any material that may be blocking the opening.

Important

Excess pressure within the test cell can be dangerous if handled improperly. Exercise caution when cleaning the cell cap openings to release pressure.

Poppet Valve Removal Tool

Periodically check the Antimony Carbon Bearing for damage or wear. To replace it:

1. Pull the collar down on the spring and remove the paddle pin that secures it to the drive shaft.

2. Unscrew and remove the retainer nut in the center of the paddle assembly cell cap.

3. Remove the paddle assembly.

4. Remove the Antimony Carbon Bearing and replace it with a new one, using the supplied Loctite to secure it in place. Allow it to cure for 4 hours prior to use.

5. Reinsert the paddle shaft into the cell cap.

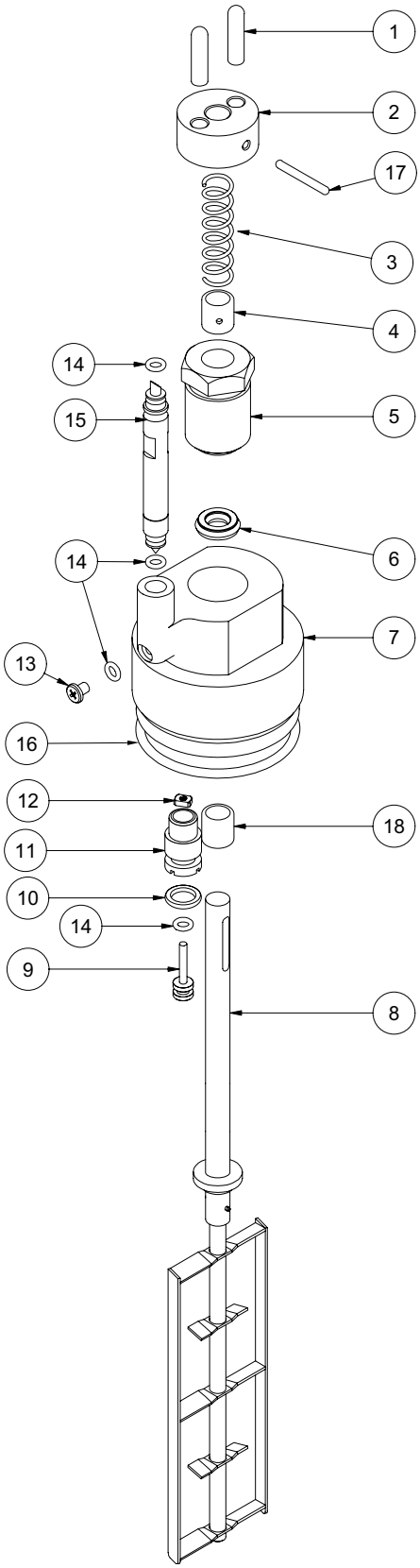
6. Screw the retainer nut back into place in the cell cap.

7. Slide the spring onto the drive shaft, followed by the collar.

8. Pull the collar down onto the spring and reinsert the paddle pin that secures it to the drive shaft.

Diagram

Refer to page 16 for a list of part numbers that corresponds to this diagram.



This parts lists corresponds to the labels on the diagram on page 15.

1	#120-70-1-068B	Pin, Qty: 2
2	#120-70-1-068A	Collar
3	#120-70-1-068J	Spring
4	#120-70-033	PTFT Sleeve Bearing
5	#120-70-1-068G	Retainer Nut
6	#120-70-025	Flexiseal
7	#120-70-1-063	Cap with Offset Valve Stem
8	#120-70-1-026	Paddle Assembly
9	#120-70-1-068D	One-way Valve
10	#120-257	O-ring
11	#120-70-1-068F	Body for One-way Valve
12	#120-70-1-068H	Retainer for One-way Valve
13	#120-70-1-068E	Screw for Seal
14	#170-17	O-ring
15	#170-16	Valve Stem, Qty: 4
16	#170-13-3	O-ring for Cell Cap
17	#120-70-1-068M	Paddle Pin
18	#120-70-033-1	Bearing, Antimony Carbon

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

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact techservice@ofite.com.