Dependable Products From People You Trust

2-Unit HTHP Filter Press

#171-00-2S - 115 Volt
#171-00-2S-1 - 200 Volt

Instruction Manual

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Ver. 3

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Intro

The OFITE 2-Unit HTHP Filter Press Heat Jacket is designed to hold two, 500-mL HTHP test cells for simultaneous testing. Each cell has a separate temperature controller and two pressure regulators (drive pressure and back pressure) for independent testing.

Specifications

Cell Size:	500 mL (Cells not included)
Maximum Temperature:	425°F (218.3°C)
Maximum Inlet Pressure:	3,000 PSI (20.7 MPa)
Maximum Drive Pressure:	1,350 PSI (9.3 MPa)
Maximum Back Pressure:	750 PSI (5.2 MPa)
Power Requirements:	115 VAC or 230 VAC configurations available (power cord included)

Components

Included:

#120-70-1-052	Hose, Stainless Steel, 18"
#130-81-015	Relief Valve
#130-81-028	Regulator
#152-37	AC Power Cord (115 Volt)
#152-38	AC Power Cord (230 Volt)
#153-14	Graduated Cylinder, 50 mL × 1 mL, Glass
#170-07	O-ring for Receiver Body
#170-19	Filter Paper, Specially Hardened for Filter Presses, 2.5" (6.35 cm) Diameter, Box of 100
#170-20	Manifold Block
#170-93	Wrench for Valve Stem
#171-10	Back Pressure Receiver
#171-23-1	Safety Pin with Lanyard
#171-45-7	Thermocouple
#174-03	Temperature Controller

Test Cells:

Test cells are not included with the instrument. The following 500 mL cells are available.

#171-19	Test Cell, for Filter Paper, Double-Capped,
#171-20	Test Cell, for Filter Paper, Single Cap
#171-191-S	Test Cell, Threaded, (For Mud Testing)
#171-192-S	Test Cell, Threaded (For Cement Testing)

Accessories:

#170-13-3	O-ring for Test Cell, Viton®/Fluorocarbon (FKM)
#170-16	Valve Stem
#170-17	O-ring for Valve Stem, Viton®/Fluorocarbon (FKM)
#170-26-1	Locking Screw, Hardened Alloy Steel

Nitrogen must be supplied in an approved Nitrogen Gas Cylinder and secured to meet safety standards.

Safety

Due to the high temperatures and pressures involved in this test, extreme care must be exercised at all times. All safety precautions must be met, especially in the cell breakdown procedure after the filtration procedure has been completed.

Cell Corrosion
Test fluids under high tempreature and pressure can corrode the cell body and caps. Carefully inspect the cell body and calls for corrosion before and after each test.

Some materials are more susceptible to corrosion than other. Also, some fluids and additives are more corrosive than others. OFITE offers a variety of cell materials for different levels of corrosion resistance and cost.

Setup

1. Remove the instrument from the crate and place it on a flat, stable surface.

2. Turn off the Nitrogen valve (horizontal). Turn off the main power switch and both heat switches. Make sure all regulators are backed off completely. Turn them completely counterclockwise.

3. Connect a Nitrogen source to the back of the unit. The inlet connector is ¼" NPT.

4. On the back of the unit is a power inlet configured for 115 VAC or 230 VAC. Plug the supplied power cord into an appropriate power source.

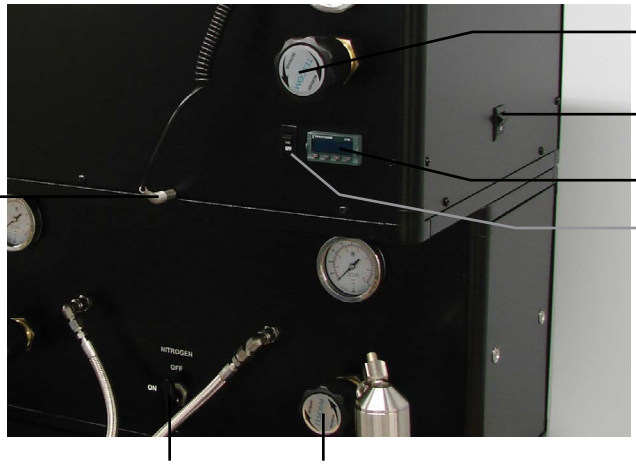
   - #171-00-2S: 115 VAC, 50/60 Hz
   - #170-00-2S-1: 230 VAC, 50/60 Hz

Operation

Although both test cells share a single Nitrogen source, they each have two regulators for adjusting drive pressure and back pressure. Each cell also has a separate temperature controller.

There is one main power switch on the right of the instrument.

The valve on the front controls the flow of Nitrogen pressure to the regulators. When the valve is horizontal, the pressure is turned on. When it is vertical, the pressure is turned off.



1. Before starting a test, make sure the Nitrogen valve is off (vertical). Turn off the main power switch and both heat switches. Make sure all regulators are backed off completely. Turn them completely counterclockwise.

2. Plug the filter press into an appropriate power source and turn the main power switch on.

3. Press the up and down arrows on the temperature controller to set the desired test temperature.

4. Turn the heat switch on. Each cell has a separate heat switch.

   The Eurotherm will display “OPI” when the heaters are engaged.

Note

5. Be sure all of the o-rings are in good working condition (pliable with no nicks or cuts, etc.), and are not damaged during the assembly procedures. Place a thin film of silicone grease on all o-rings.

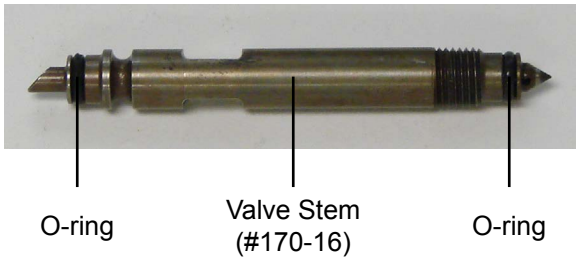
Tip

Nitril-NBR (Buna N) o-rings (#170-13) are recommended for tests up to 250°F (121°C). For tests up to 400°F (204°C), Fluorocarbon/FKM (Viton®) o-rings (#170-13-3) are recommended. For tests up to 500°F (260°C), Perfluorocarbon (FFKM) o-rings are recommended. Also, for tests with water-based fluids containing **no hydrocarbons**, Ethylene propylene (EPM/EPDM) o-rings may be used up to 400°F (204°C).

6. If the cell caps are not already assembled, see page 13 for assembly instructions.

7. Inspect the cell cap and cell body. Discard any components that show signs of corrosion, damage, or wear.

8. Inspect all o-rings. Replace any that show signs of damage or wear. Looks for nicks, cuts, or brittle o-rings. Replace all o-rings after any test above 350°F (176.7°C). Place a thin film of silicone grease on all o-rings.



9. Place an o-ring (#170-13-3) on the shoulder inside the cell body on the end marked “In”. Place another o-ring in the groove around the cell cap.

10. For Cement Testing, place a cement screen on top of the o-ring.

11. Screw the inlet cell cap into the cell body.

12. Place an o-ring in each of the two o-ring grooves on both valve stems.

13. Screw one valve stem into the inlet cell cap. Tighten the valve stem completely.

Tip

To increase the life of the valve stem and cap, apply a thin layer of high-temperature thread lubricant (#165-44-1) to the tip of the valve stem.

14. Prepare the test fluid.

15. Invert the cell body and carefully pour the sample into the cell. Leave enough void space for thermal expansion (see chart below).


Note

Be careful not to spill fluid on the o-ring shoulder inside the cell.

API Recommended Void Space		
Fluid / Temperature	Void Space	Fluid Volume
Water-based drilling fluid. < 300°F	0.6" (1.5 cm)	405 mL
Water-based drilling fluid. > 300°F	1.5" (4.0 cm)	353 mL
Oil-Based Drilling Fluid. Any temperature.	1" (2.5 cm)	382 mL
Cement, Any Temperature	2" (5.1 cm)	324 mL

16. Place an o-ring in the cell and another on the cell cap.

17. Place a circle of filter paper, ceramic disk, or cement screen on top of the cell o-ring. Gently push the paper or disk downward so it contacts the o-ring without the paper binding or pinching.

18. Screw the outlet cap into the cell body.

19. Screw the other valve stem into the outlet cell cap and tighten it completely.

20. Invert the cell and place it in the heating jacket with the outlet (filter) side pointed down. Rotate the cell in the heating jacket so that the pin in the bottom of the heating well seats into the hole in the bottom of the test cell. This will anchor the cell in the well and prevent it from rotating as the valve stems are opened and closed.

21. Move the thermometer from the heating jacket to the hole in the test cell.

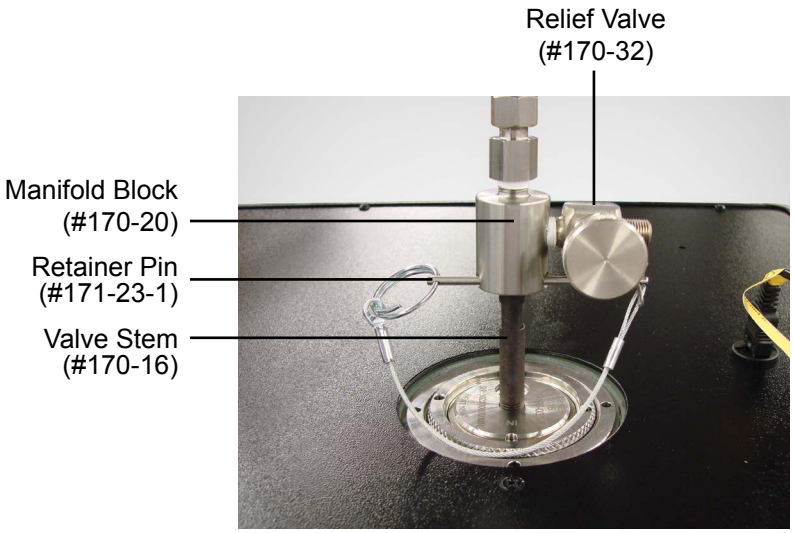

Note

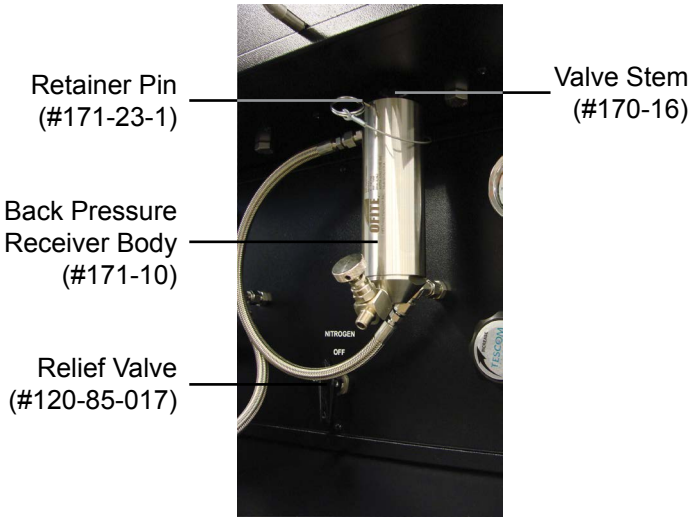
Allow the cell to heat for one hour. Start a 60 minute timer now.

Important

22. Connect the Nitrogen hose on top to the top valve stem and lock it in place with the safety pin. Place the back pressure receiver on the bottom valve stem and lock it in place with the safety pin.

    The safety pin includes an attached lanyard. The lanyard secures the pin and prevents it from accidentally disengaging from the valve stem and pressure assembly. Always secure the pin with the lanyard.





23. Connect the bottom pressure hose to the back pressure receiver (if it is not already connected). Make sure the needle valve on the back pressure receiver is closed.

24. Unscrew the bottom back pressure regulators (counterclockwise) to make sure both regulators are completely closed.

25. Connect a Nitrogen cylinder (at least 1,500 PSI) to the inlet on the back of the filter press. Open the pressure release valve on the nitrogen bottle and note the bottle pressure as registered on the gauge.

26. Keeping the valve stems closed, turn the Nitrogen ball valve on and adjust the top and bottom regulators to the recommended **back pressure** for your test (see chart below). Make sure the bleeder valves are closed.

Note

The upper and lower limits of the test pressure differential are determined by the test temperature. As this temperature exceeds 212°F (100°C), the back pressure must be increased in order to prevent vaporization of the filtrate. The 500 PSI differential pressure must be maintained, so the top pressure will have to be increased accordingly. The table below shows the pressures recommended for various test temperatures.

Recommended Minimum Back Pressure

Test Temperature		Vapor Pressure		Minimum Back Pressure	
°F	°C	psi	kPa	psi	kPa
200-299	95-149	12.1-67	84-462	100	700
300-374	150-189	67-184	462-1269	200	1400
375-399	190-199	184-247	1269-1704	275	1900
400-424*	200-219	247-326	1704-2245	350	2500
425-450*	220-230	326-422	2245-2912	450	3100

**For tests above 400°F, use Perfluorocarbon (FFKM) o-rings*

27. Open (loosen) the top valve stem ½ turn to pressurize the sample. Maintain this pressure on the fluid until the temperature has stabilized.

28. After the one hour heat up time, increase the pressure on the top pressure unit to 500 PSI (3,448 kPa) more than the back pressure.

29. Open (loosen) the bottom valve stem ½ turn to initiate filtration as soon as possible.

    Monitor the pressure gauges closely. If at any time during the test the pressure inside the cell rises above the setpoint, carefully open the needle valve on the manifold block just enough to bleed off the excess pressure. Then close the valve. If the cell pressure decreases due to collection of filtrate, increase the pressure with the top regulator.

Tip

30. To collect filtrate, carefully open the valve on the bottom of the back pressure receiver while holding a graduated cylinder up to the valve port. Close the valve immediately after the pressure begins to decrease and the filtrate is collected.

    Collect filtrate at 10 seconds, 1 minute, 7.5 minutes, and 30 minutes. The initial 10 second collection is precautionary in nature, as a fluid with little filtration properties may fill up the receiver tube almost immediately, potentially damaging the regulator. Do not record the 10 second collection as a separate notation, but do record the volume collected at the other time intervals.

Note

    While collecting filtrate, maintain the test temperature within ± 5°F (±3°C). If the back pressure rises during the test, cautiously reduce the pressure by opening the valve on the receiver and drawing off some of the filtrate into the graduated cylinder.

31. At the end of the test, close (tighten) the top and bottom valve stems to seal off the cell.

    Failure to close the valve stems before releasing pressure will damage a regulator by drawing fluid into it.

Important

32. Slowly turn the regulators counterclockwise to close off the flow of pressurized gas.

33. Open the outlet valve on the back pressure receiver to collect all of the remaining filtrate.

34. Open the bleeder valve on the manifold block to release any remaining pressure in the line.

35. Remove the manifold block and the back pressure receiver. Drain any residual filtrate from the receiver into the graduated cylinder.

Important

The heating jacket will still be very hot. Be careful not to touch it while removing the back pressure receiver.

36. Remove the cell from the filter press after once again checking that the valve stems are tightly closed. Allow the cell to cool to room temperature.

Tip

An optional Cell Carrying Tool (#170-40) makes this a simple and safe operation.

Important

The test cell will still be under approximately 600 PSI (4.140 kPa) of pressure. To avoid possible injury, keep the cell upright and cool it to room temperature before disassembling. The cell must be cool for at least one hour at room temperature before loosening the locking screws and removing the cell cap.

37. Using extreme care to save the filter cake, place the cooled cell upright with the outlet side down. Slowly open (loosen) the inlet valve stem to bleed off pressure from the cell body.

Tip

Pressure cannot be relieved from the cell by opening the outlet valve stem as the filter cake will seal off the cell. It is a good idea to open the valve stem with the cell inside a sink or with a rag over the valve stem in order to catch any liquid that might be ejected.

38. Once the pressure is released, tighten the valve stem again to keep the fluid inside. Then turn the cell over.

39. Loosen the valve stem and unscrew and remove the outlet cell cap. Use the supplied cell cap wrench to loosen the threads.

Important

If the cell cap is difficult to unscrew, the pressure port may be clogged. Use the HTHP Pressure Relief Tool (#170-91) to clear the obstruction.

40. Carefully remove the filter paper or ceramic disk and deposited cake. Be careful not to damage the filter cake. Carefully wash any residual fluid from the surface of the filter cake.

41. Pour out the test fluid.

42. Clean and dry the apparatus thoroughly after each use. Inspect all of the o-rings and replace any that show signs of wear or damage.

Data

Filtrate Volume
The HTHP filter press has a filtration area of 3.55 in^2 (22.9 cm^2). This is half the area of a standard filtration test, which is 7.1 in^2 (45.8 cm^2). To compare the results of this test to a standard filtration test, you double the total filtrate volume collected.

$$V_S = 2\ (V_{30})$$

Spurt Loss (Optional):
Spurt Loss is the amount of filtrate collected before the filter cake has had a chance to form and is expressed in millimeters. To calculate the spurt loss, use the following equation:

$$V_1 = 2\ [V_{7.5} - (V_{30} - V_{7.5})] = 2\ (2V_{7.5} - V_{30}) = 4V_{7.5} - 2V_{30}$$

Where:

V_s = Standard Filtrate Volume (mL)
V_1 = Spurt Loss
$V_{7.5}$ = Filtrate volume collected after 7.5 minutes (doubled)
V_{30} = Filtrate volume collected after 30 minutes (doubled)

Filter Cake
Wash the filter cake on the paper with a gentle stream of water. Measure and report the thickness of the filter cake to the nearest 1/32 in (0.8 mm). A ruler with the “zero mark” at the very edge of the ruler is useful here. Cake descriptions may be subjective and such notations such as hard, soft, rubbery, and fine, etc. convey adequate information on cake quality.

Cell Cap Assembly

☑ Tip

1. Choose the appropriate cap for your test:

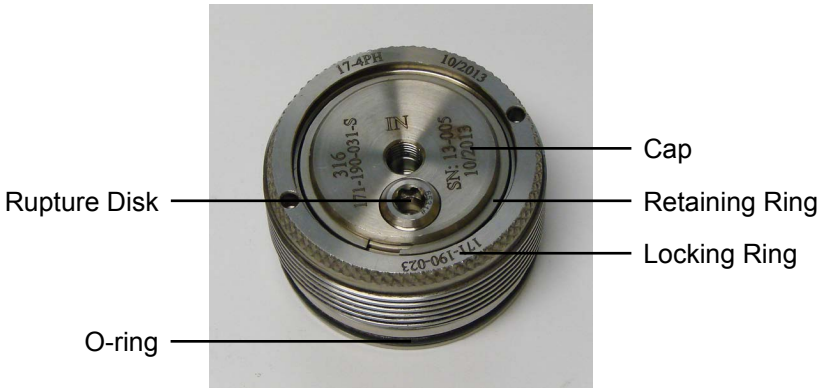
   - 171-190-030-S - Outlet Cap, 60 Mesh
   - 171-190-031-S - Inlet Cap, 60 Mesh
   - 171-190-032-S - Outlet, for Cement
   - 171-190-033-S - Inlet, for Cement
   - 171-190-034-S - Outlet, Cap for Ceramic Disk

2. Place the locking ring (#171-190-023) around the cap.

3. Place the retaining ring (#130-81-040) into the groove around the outside of the cap. Make sure it engages completely around the circle.

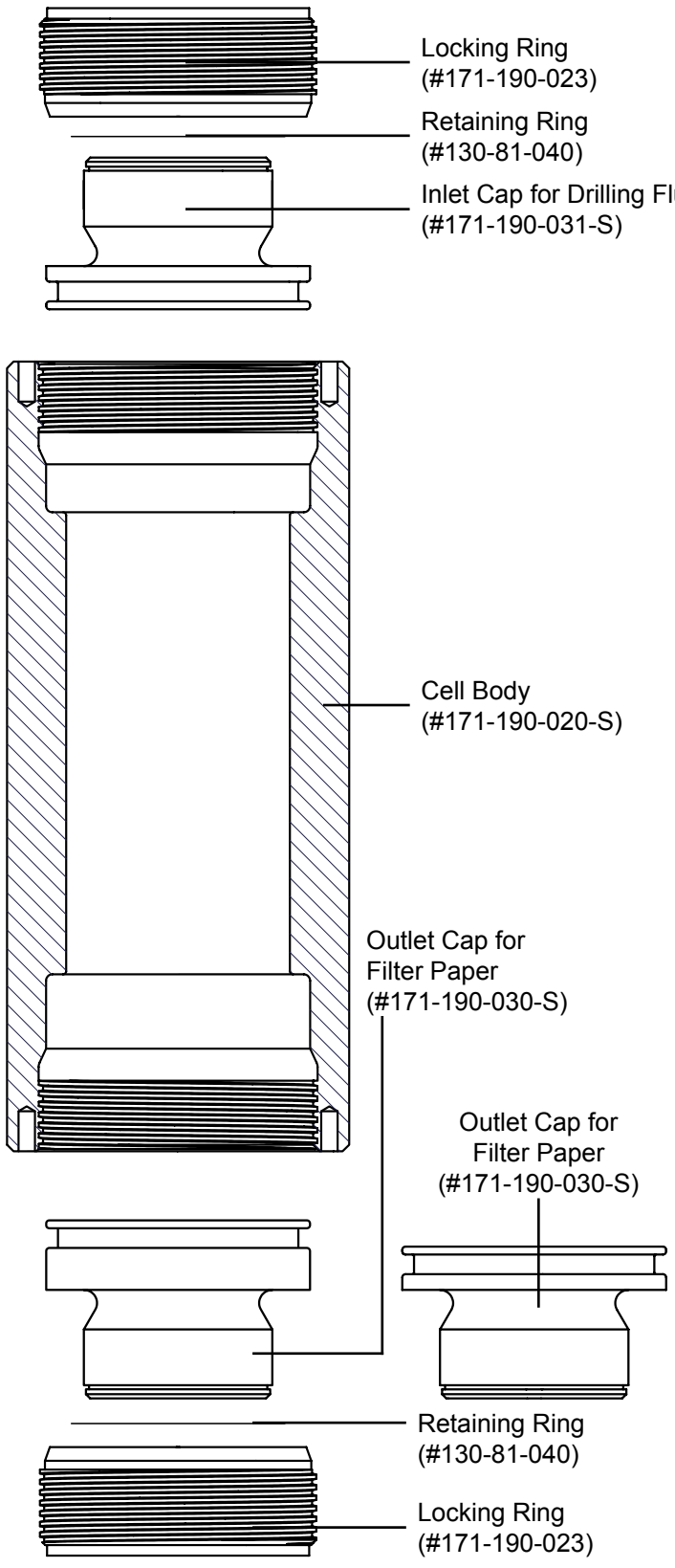
   The cap should turn freely inside the locking ring.

4. Place an o-ring in the port in the cap. Wrap a rupture disk (#171-190-027) with nickel anti-seize tape (#171-190-040) and screw it into the port.

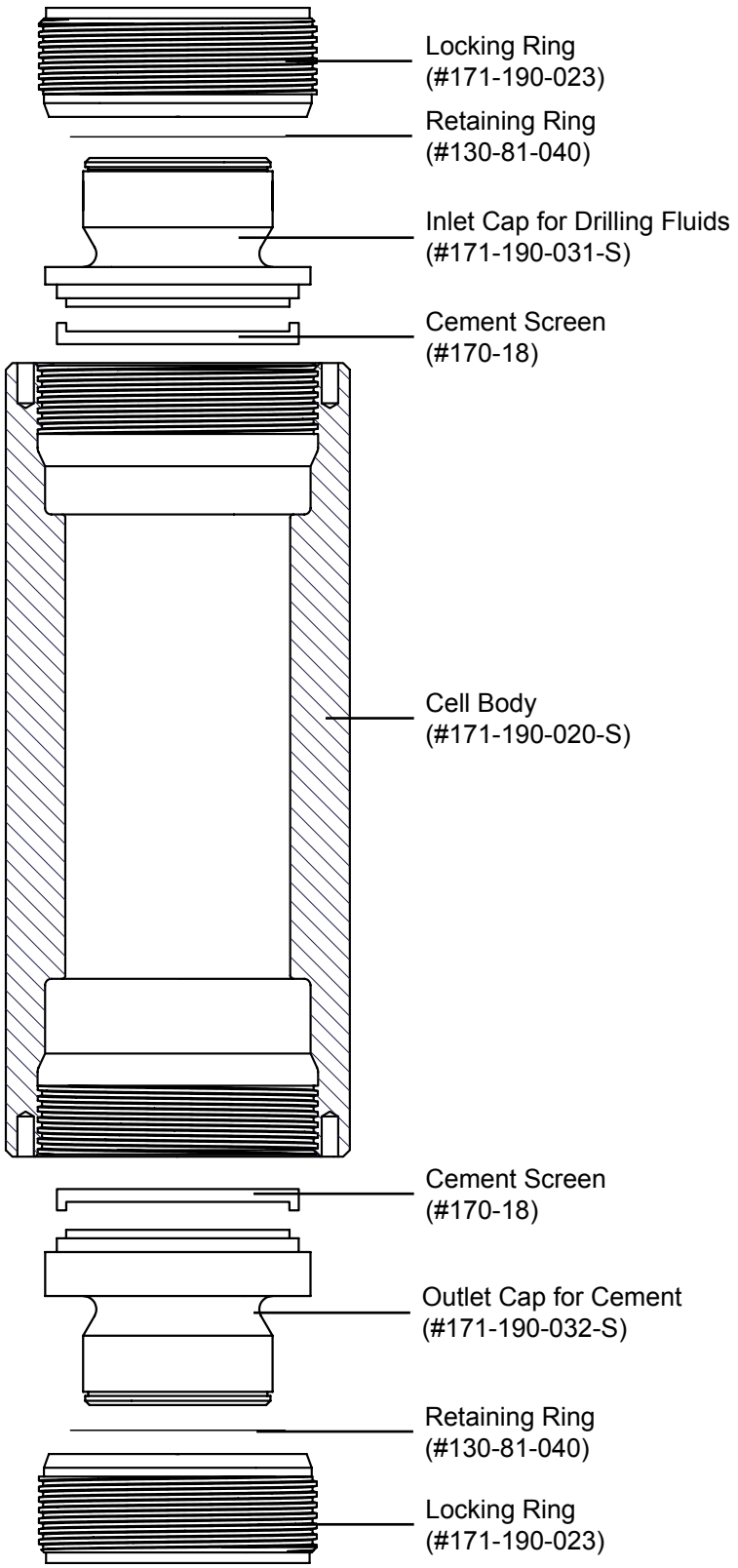


Diagrams

#171-191-S - Test Cell, Stainless Steel (For Mud Testing)



#171-192-S - Test Cell, Stainless Steel (For Cement Testing)



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.