

INSTRUCTIONS:
**ASSEMBLY OF SPECIAL 10” CELL
FOR HIGH PRESSURE, HIGH TEMPERATURE
FILTER PRESS**

While much of the 10” cell for the high pressure, high temperature filter press (HPHTFP) is standard, the ends of the cell have been modified to accommodate either 1/8” or 1/4” thick filters as well as the standard paper or thin metal filters. The ends of the cell are marked “1/8” filter” or “1/4” filter” to indicate which thickness of filter or spacer ring is to be used.

The grooved cap can be used on either end with the proper thickness of filter as the outlet cap. When using the 1/8” filter and grooved cap as the outlet a long cap is provided to use as the inlet cap. However, the standard NO. 171-21 cap (.94 thick) can be used with the 1/4 spacer ring as the inlet.

When using a 1/4” thick filter on the outlet end of the cell, it should be backed up with the grooved cap. Then the 171-21 cap is to be used on the inlet (1/8” filter) end with the 1/8” spacer ring.

If a paper or thin metal filter is to be used as the filter, use the long cap (1.190 in.) with the 60 mesh screen on the 1/4” filter end. The inlet end then will be the 1/8” filter end closed with either the scribed cap or the 171-21 cap (standard) with the 1/8” spacer ring.

Always install the spacer rings with the solid side toward the o-ring in the groove of the cell. Be sure the o-ring in the spacer is properly seated before installing the cap. Do not use a filter on the inlet end of the cell.

Each cap is designed to use one of the No. 170-13 valve stems which operate as needle valves. When tight they prevent the flow of nitrogen from the high side of 171-24 nitrogen manifold into the cell and filtrate from the cell into the backpressure receiver, which has nitrogen pressure from the low side of the 171-24 manifold. When the test is ready to begin with the proper test temperature and pressure reached the inlet valve and outlet valve are opened 1/4 turn as explained in the procedure below. Refer to assembly DWG. NO. 171-00-A-5.

TEST PROCEDURE:

1. Connect the heating well power cord to the appropriate power source. Place a dial-type metal thermometer in the thermometer well and preheat the heating jacket to the desired test temperature. A pilot light will come on when the heating jacket is at the desired temperature selected by the thermostat control knob.
2. Select the desired inlet cap and spacer ring as required in the end of the cell that is to be the inlet. Refer to assembly dwg 171-19-x-5C. Be sure the o-rings are in good condition. If tests are run above 300 deg. F, the o-rings probably will need to be replaced after each run. Place the proper spacer ring with its o-ring into the end recess with the solid edge first. Align the detents in the cap with the screws in the cell body. With the screws backed out for the cap to clear, push the cap into the cell. A thin film of high temperature lubricant on the o-ring will help it slide in. Then tighten the set screws. Be sure they are all seated properly and snug. Also, be sure to use hardened steel set screws, No. 170-26-1, if pressures above 1250 psi are to be used. Install a 170-16 valve stem with o-rings in the cap and close.
3. Load the cell with ward mud from the flowline or a freshly stirred sample. Care should be exercised not to fill the cell closer than 1 inch from top to allow for expansion as the mud heats, and to ensure that no mud is spilled on the cap o-ring or on any of the cell sealing parts. A 300 ml sample is recommended.
4. Selection and insertion of filter material
 1. 1/8” or 1/4” filter material: Soak the filter disc to be used in the liquid phase used to make up the mud to be tested for about 5 minutes. Then carefully place the disc on the o-ring in the outlet end of the cell. (The thickness must match the notation on the end of the cell). Be sure the set screws are backed out enough to clear the cap. Check the o-ring on the scribed cap. Replace if necessary. Then slightly coat the o-ring with high temperature lubricant. Align the detents in the cap with the set screws in the cell body and push the cap into place. Tighten the set screws. Be sure they are properly seated then make them snug in the detents.
 2. Paper or thin metal filter material:
 - a. After checking the o-ring in the cell, place the 1/8” or 1/4” required spacer ring with its o-ring in place, solid side down (toward the cell o-ring). Then lay the thin filter on the spacer ring and insert the standard 171-21 cap as described above. If desired, the groove cap can be used to back up the filter.
 - b. If the outlet end being used is the one for 1/4” filters, the long end cap with a 60 mesh screen can be used. This will eliminate the need to use the 1/4” spacer ring. Align the cap and tighten the set screws as above.
 - c. Insert valve stem, close and tighten after checking the o-rings.
5. Heating the Sample to the Test Temperature
 - a. Lower the filtration cell into the preheated heating well with the outlet end down.
 - b. Rotate the cell in the heating well so that the pin in the bottom of the well will seat into a hole in the bottom of the cell. This anchors the cell in the well preventing the cell from rotating as the valve stems are opened or closed.
 - c. Check the drain valve stem to make sure that it is tightly closed.
 - d. Attach the high-pressure line (with 1500 psi gauge) from the nitrogen manifold to the inlet stem and insert the locking pin.
 - e. Close the bleeder valve on the high-pressure line.

- f. Check the “T” screws on the pressure regulators to be sure that they are unscrewed (counterclockwise) and no pressure will be applied.
- g. Open the valve on the nitrogen bottle. The bottle pressure will be registered on the middle manifold gauge.
- h. For filtration tests above 200 deg. F, the sample must be heated under pressure. Suggested applied pressures for various test temperatures are given in Table 1. To apply pressure to the cell:
 - 1. Turn the T-screw on the left regulator clockwise until the desired pressure is registered on the gauge. Increase the pressure applied to the test sample so that the difference between the applied pressure and the backpressure is 500 psi.
 - 2. With a crescent wrench, open the inlet stem on the filtration cell ¼turn.
- i. For filtration tests above 200 deg. F, attach the backpressure receiver to the drain stem and secure with a locking pin. The receiver is connected to the right hand regulator.
- j. The time required to heat the sample to the test temperature will be between ½ to 1 hour, depending on the test temperature. The temperature of the cell can be checked by placing a metal dial thermometer in the thermometer well in the cell wall. An inlet cap with a thermo well, which extends into the fluid under test, is available on special order.

6. Conducting the Filtration Test

- a. After the cell has reached the test temperature, apply back pressure to the receiver as follows:
 - 1. Close the drain valve on the receiver. This valve is also used as the bleeder valve.
 - 2. Turn the “T” screw on the right regulator clockwise until the desired backpressure is registered on the gauge. (Select the proper backpressure from Table 1).
- b. With a crescent wrench, open the drain stem ¼turn, and allow mud and/or filtrate to flow into the receiver. Open the drain valve and collect the fluid in a graduated cylinder. If a ¼” thick filter is being used, the receiver will be collecting a spurt of fluid which had been soaked into the filter. Then the receiver will blow dry. Record this spurt separately. Close the drain valve after the spurt stops. Then periodically drain the filtrate coming through into another graduate to be recorded as filtrate from the fluid under test. Continue this until the 30-minute test is complete. Then record the total filtrate volume. Note: The actual top and bottom pressure combination depends on test temperature and is shown in Table No. 1.
- c. Correct the filtrate volume to standard filtration test area by doubling the filtrate volume collected in 30 minutes.
- d. After 30 minutes, turn off the power to the heating well. Then close the valve on the nitrogen bottle and turn the handles on the regulators of the manifold counterclockwise to cut off the pressure to the cell and receiver. Then bleed off the pressure by opening the valves slowly on the top manifold connector and then drain valve on the receiver. Then remove the top manifold connector and the backpressure receiver.
- e. Remove the cell from the heating well. Use gloves or pads to protect your hands from the heat. The cell can be lifted by the top valve stem.
- f. Allow the cell to cool at atmospheric temperature. The cell can be rapidly cooled with running water. Caution: The temperature of the mud in the cell must be reduced to below the boiling point of water before the cell can be opened safely.

- g. After the cell has cooled adequately, bleed the pressure from the cell by opening the inlet valve stem with the cell in an upright position. Be sure all the pressure is removed from the cell. Cover the inlet valve as it is opened.
- h. Loosen the cap locking screws and remove the caps. Use care in removing the filter disc and filter cake for measuring.
- i. Remove the mud and clean all parts. Check the o-rings and replace any that are damaged. Make the equipment ready for the next test.

REMARKS:

1. The upper and lower limits of the pressure differential are determined partly by the test temperature. As the test temperature exceeds 212 deg. F, the backpressure must be increased to allow for the increased vapor pressure of the water filtrate at the higher temperature. The 500 psi differential must be maintained, so the top pressure must be increased by the same amount. Table No. 1 shows the pressures recommended for various test temperatures.
2. 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 when the filtration is complete.

TABLE I
RECOMMENDED
STARTING CELL PRESSURES AND BACK PRESSURES
FOR VARIOUS TEST TEMPERATURES

<u>Temperature Range, deg. F</u>	<u>Heating Pressure or Back Pressure, psi</u>
Less than 200	0
200 – 300	100
301 – 350	150
351 – 375	200
376 – 400	250
401 – 425	350
426 – 450	450
451 – 475	550
476 – 500	700

NOTE: Nitrogen Manifolds having a 600 psi gauge for backpressure need to be modified to attain the 700 Psi. However, tests are possible within the limits of the manifold.

CAUTION: USE NITROGEN ONLY FOR PRESSURE.

OTHER REGULATOR ASSEMBLIES ARE AVAILABLE FOR USING CARBON DIOXIDE.

SPECIAL HPHT FILTER PRESS
FOR 1/8” or 1/4” FILTER DISCS
EQUIPMENT PARTS AND LIST

<u>QUANTITY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	171-00-2	Heating jacket, either 115 volt or 230 volt AC as required. A stop has been added to hold the cell off the bottom of the well for filling while preheating. Also, a larger bottom hole is provided.
1	171-90-3X	Cell (500 ml) and end caps with hardened steel locking screws.
1		1/4” spacer ring with No. 140 o-ring
1		1/8” spacer ring with No. 35 o-ring
1	171-10	Backpressure receiver, 100 ml
1	171-24	Dual nitrogen manifold
10	170-53	Ceramic discs, 1/4” thick by 2 1/2 dia, 10 darcies, 35 micron
1	170-19	2 1/2 filter paper, 100/bx

1	154-10	Metal dial thermometer, 50 500 deg. F.
1	153-14	Graduated Cylinder, 50 ml
2	170-16	Valve stems – standard
1 set		Spare o-rings for valve stem, en caps and spacer rings
1	170-27	5/16” Allen wrench
1	170-35	6” wrench

OPTIONAL EQUIPMENT:

170-53-1	Ceramic discs, 20 Darcies, 60 Micron
170-53-2	Ceramic discs, 0.4 Darcies, 3 Micron
170-51	Ceramic discs, 3.5 Darcies, 20 Micron
170-53-2	Ceramic discs, 0.75 Darcies, 5 Micron
170-53-3	Ceramic discs, 2 Darcies, 10 Micron
170-53-4	Ceramic discs, 100 Darcies, 90 Micron

The OFI TESTING EQUIPMENT high pressure – high temperature filter press is specially designed for testing drilling muds, and other substances such as cement, at elevated temperatures and pressures. The test is very similar to the API filtration test except the temperature and pressure is elevated to simulate bottom-hole conditions, thereby providing a more reliable method for determining the effectiveness of the material being used. The OFI TESTING EQUIPMENT HPHT Filter Presses are available in 2 sizes: 500 ml and 250 ml approximately. They consist of a thermo stated heating well (115 volt or 230 volt), a sample cell with various filter arrangements, a backpressure receiver, and pressure control device. A 500 ml unit is available for operation to 4000 psi. It uses hydraulic pressure. Adapters are available for running these inverted in the Permeability Plugging Tester.

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