



Dependable Products From People You Trust



Reservoir Permeability Tester

Part No. 127-00

Instruction Manual

Updated 7/23/2021

Ver. 7

OFI Testing Equipment, Inc.

11302 Steeplecrest Dr. · Houston, Texas · 77065 · U.S.A.

Tele: 832.320.7300 · Fax: 713.880.9886 · www.ofite.com

©Copyright OFITE 2015

Table of Contents

Intro	2
Description	2
Specifications	3
Components	4
Safety	5
Preparation	6
<i>Loading the Core</i>	9
<i>Rotating Cell</i>	10
<i>Treating Fluid</i>	11
<i>Filling the Transducer System</i>	14
<i>Priming the HPLC Pump</i>	15
Operation	16
<i>Reversing Direction of Flow</i>	18
<i>Running Fluids in Series</i>	19
<i>Shut-Down Procedure</i>	20
Software	21
<i>Options</i>	22
<i>Calibration</i>	23
<i>Configuring Eurotherms</i>	24
<i>Operation</i>	25
Appendix	26
<i>Pressure Testing</i>	26
<i>Calculations</i>	27
<i>Cleaning</i>	28
<i>Storing the RPT</i>	29
<i>Adjusting the Casters</i>	29
Warranty and Return Policy	30

Intro

The permeability of a petroleum reservoir is one of the most influential factors in determining the production capabilities of a producing formation. Permeability is a measure of the ability of a fluid to flow through a porous media when subjected to a differential pressure and is mathematically equated by Darcy's law.

The Reservoir Permeability Tester (RPT) is a high-temperature, high-pressure test apparatus designed to measure formation (core) response to acid, brines, oils, or gas.

Description

The RPT consists of three pressuring systems: confining pressure, drive pressure, and back pressure. **Confining pressure** surrounds the core specimen with water and prevents the treating fluids from going around the side of the core or escaping through the sides. The **drive pressure** is controlled by the HPLC pump and uses a hydraulic fluid to push the treating fluids through the core. The **back pressure** is set just high enough to keep the treating fluids from boiling at the test temperature.

At the beginning of a test, confining pressure and back pressure are applied to the core during the heating process. When the core reaches test temperature, the HPLC pump is turned on and hydraulic fluid is pumped into one of three 1.5-liter stainless steel accumulators. The accumulator contains a floating piston that separates the hydraulic fluid from the treating fluid. As the hydraulic fluid is pumped in, the treating fluid is pumped out and through the core specimen. A transducer measures the pressure going into the core and the pressure coming out of the core and displays the difference on the front panel of the unit.

During the test, the flow of pressure can be diverted into any of the three accumulators, allowing for the testing of multiple treating fluids. In order to test return permeability, the direction of the flow can also be reversed, sending the treating fluid through the core in the opposite direction.

All data is simultaneously recorded and graphed on a PC, which can then store the data for later recall.

*Not for use with heavy crudes. Fluids must be in a liquid state at ambient temperature.

Specifications

Size:

Net Size: 44" × 20" × 45.5" (111.8 × 50.8 × 115.8 cm)
Net Weight: 519 lb. (235.4 kg)
Crated Size: 51" × 31" × 60" (129.5 × 78.7 × 152.4 cm)
Crated Weight: 726 lb. (329 kg)

Maximum Pressure:

Drive: 3,000 psi (20.7 MPa)
Confining: 5,000 psi (34.5 MPa)
Back Pressure: 1,000 psi (6.9 MPa)

Temperature Controller:

1 Digital PID with 1° Resolution; Max 400°F (204.4°C)

System Requirements:

Air: 100 – 120 psi (689.5 – 827.4 kPa)
Nitrogen: 1,000 – 2,000 psi (6.9 – 13.8 MPa)
Water: 30 – 40 psi (206.9 – 275.8 kPa)
Electrical: 230 VAC

Components

#127-00-205	Accumulator Cap and Piston O-ring, Qty: 12
#127-00-207B	Hassler Cap Insert, 1.5"
#127-00-207C	Hassler Cap Insert, 1", Qty: 2
#127-00-210	Hassler Cell Cap Rod, Qty: 4
#127-00-212	Hassler Cap O-ring, Qty: 2
#127-00-213	Hassler Insert O-ring, Qty: 2
#127-00-235	Core Sleeve, 1.5"
#127-00-247	75 mL Sample Cylinder with ¼" FNPT Ports, Qty: 2
#127-00-310	Accumulator Fill Pump, 230V
#130-75-71	Monitor
#130-75-74	Desktop Computer
#130-76-03	Thermocouple
#130-79-15	Serial Cable, OB9 M/F
#166-05	230 Volt (European Plug) Adapter
#220-10A-EURO	AC Power Cord, 3-Conductor, International (Continental European), Qty: 3
#700-100-027-2	Core Sleeve, 1" Diameter, 7" Long, Viton, Qty: 40

Optional:

#127-02

#122-073-1	Fuse, 3 Amp, 5 mm × 20 mm, Qty: 12
#122-074-1	Fuse, 5 Amp, 5 mm × 20 mm, Qty: 12
#127-00-205	Accumulator Cap and Piston O-ring, Qty: 20
#127-00-212	Hassler Cap O-ring, Qty: 72
#127-00-213	Hassler Insert O-ring, Qty: 18
#127-00-235	Core Sleeve, 1.5", Viton, Qty: 40
#127-00-240	83 Series ¼" Three-Way Stainless Steel Ball Valve, 6,000 psi (14.4 MPa), Qty: 2
#127-00-242	83 Series ¼" Two-Way Stainless Steel Ball Valve, 6,000 psi (14.4 MPa), Compression Fittings, Qty: 2
#127-006	ISCO Pump Repair Kit
#171-45-4	Thermocouple, Qty: 2
#700-100-027-2	Core Sleeve, 1" Diameter, 7" Long, Viton, Qty: 40

Spare Parts for Two Years (Sold Separately):

Safety

The RPT is designed to test the effects of brines, acids, oils, or gas on core specimens at elevated temperatures and pressures. Read and understand these instructions completely before attempting to operate this equipment. Before beginning regular operation, make several trial runs using non-reactive fluids at moderate temperature and pressure to familiarize yourself with the operating procedure.

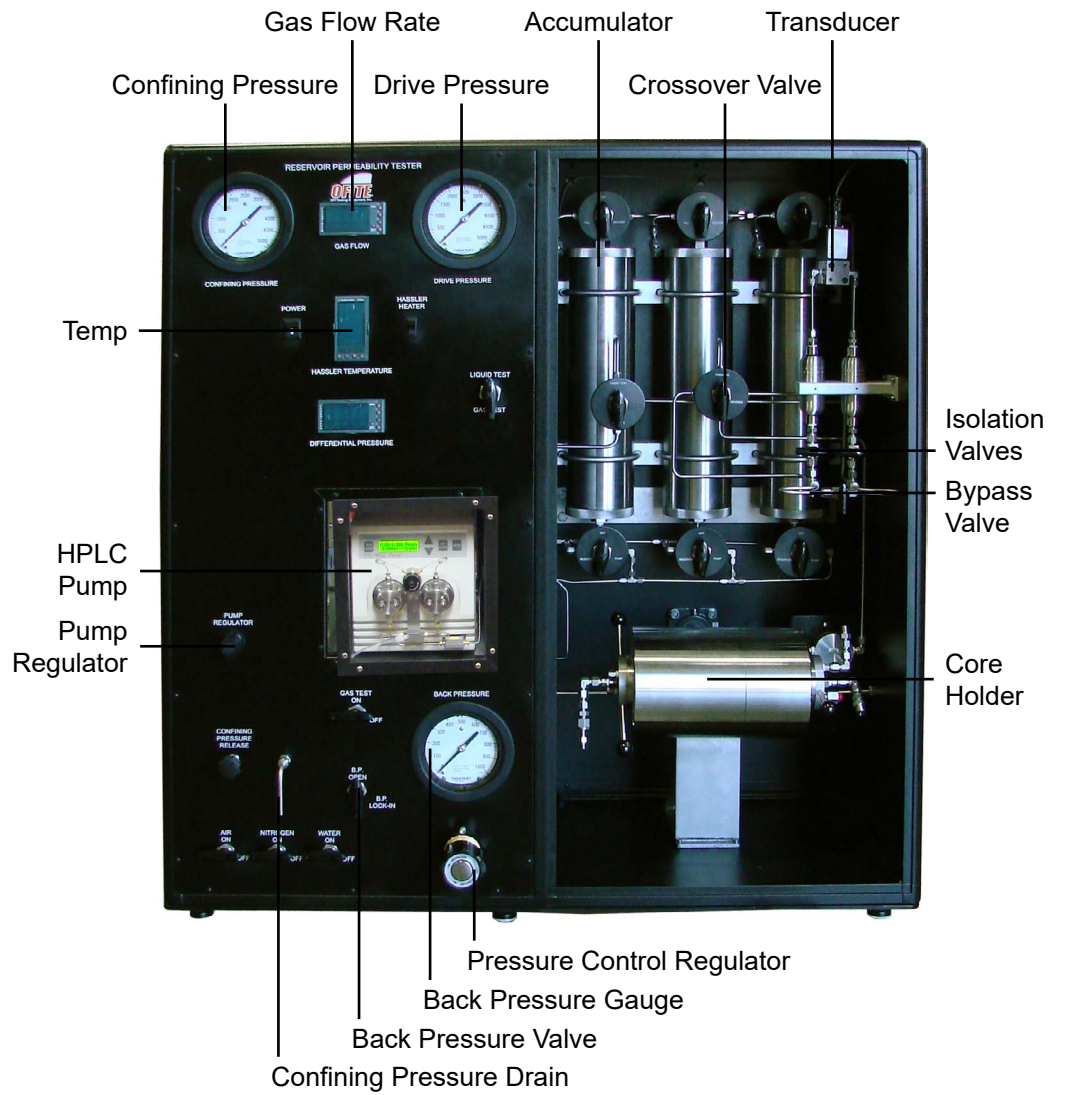
When testing the effects of acids and brines on formation core specimens at simulated downhole conditions, it is important to adhere to the following safety precautions:

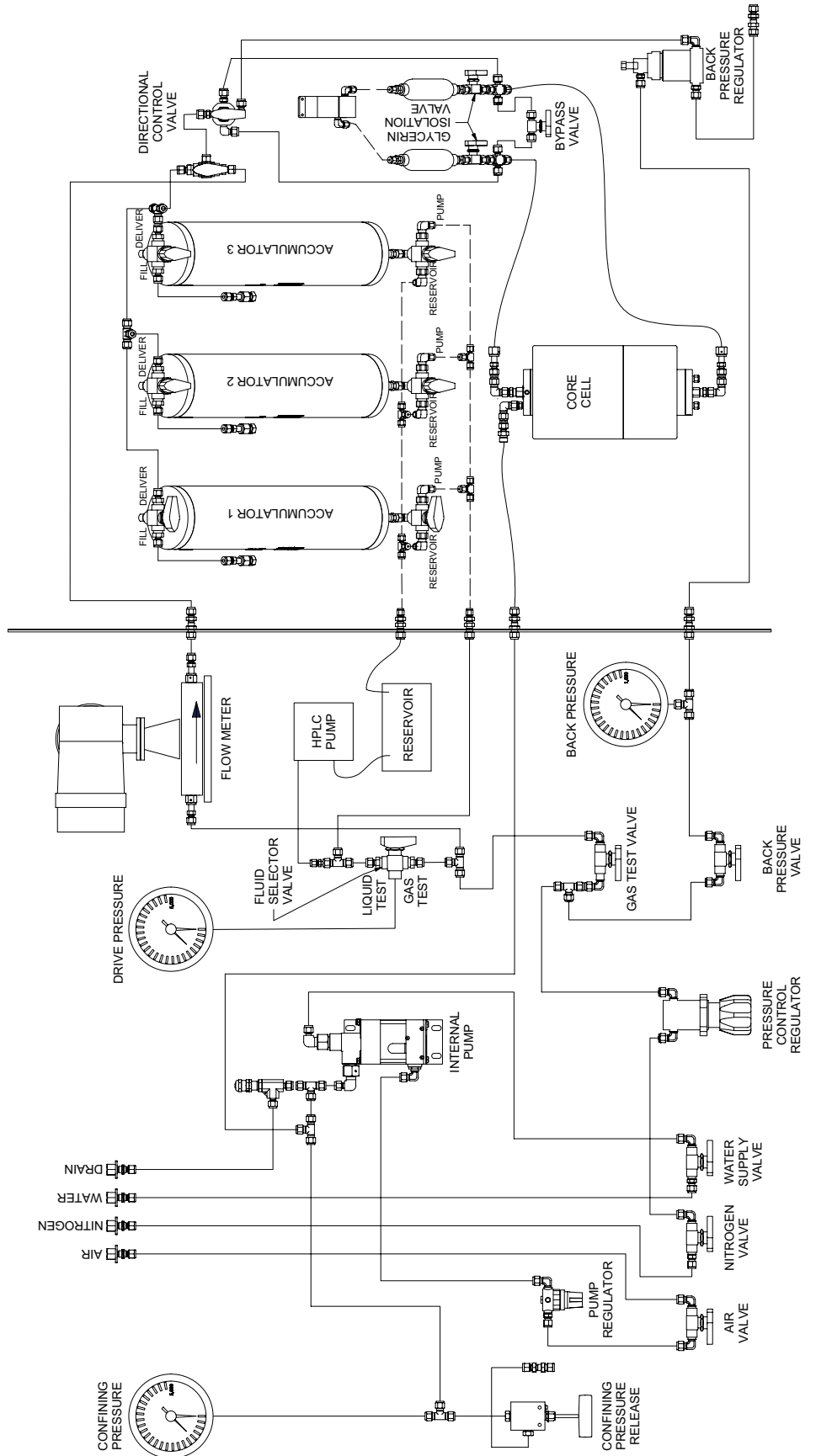


1. Wear rubber gloves, eye protection, and a lab coat or apron at all times while operating the unit.
2. All acids must be inhibited to prevent excessive corrosion and damage to the instrument.
3. At elevated temperatures, the confining pressure in the core holder will increase due to thermal expansion. The core holder has an emergency pressure release valve set to 5,200 psi (35.9 MPa), which will prevent any damage to the sleeve. However, the core specimen may be destroyed if the pressure is not carefully monitored and controlled by the operator. Relieve the pressure buildup through the "Confining Pressure Release" valve.
4. All tests fluids must be clean and contain no solids to avoid plugging and erosion of component parts.
5. Before connecting the RPT to power, air, or water sources, make sure all of the valves are in the closed or "Off" position.
6. The RPT has three separate pressuring systems, each with its own maximum pressure. Do not exceed these pressures:
 - Confining Pressure: 5,000 psi (34.5 MPa)
 - Pump Pressure: 3,000 psi (20.7 MPa)
 - Back Pressure: 1,000 psi (6.9 MPa)
7. In the event of an emergency, immediately shut off the main power switch and close the air and nitrogen supply valves.

Preparation

1. Carefully remove the unit from the crate and place it on a flat, level surface with access to air, water, nitrogen, and power sources.
2. Connect the water, air, and nitrogen sources to the appropriate ports on the back of the unit. Plug the unit into a 220V power source.
3. Place the PC near the RPT. Connect the PC to the RPT with the supplied serial cable.





Preparation

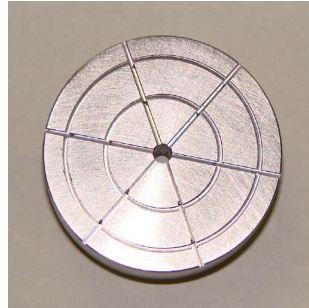
Loading the Core

1. The RPT is designed to test core specimens 1" (2.5 cm) or 1½" (3.8 cm) in diameter and between 2" (9.5 cm) and 6" (15.2 cm) long. Core specimens should be prepared using a 1.5" (3.8 cm) core drill and the ends should be sawed or milled so that they are parallel and as perpendicular to the sides as possible.
2. The core specimen should be saturated in a synthetic or natural formation brine to simulate "in-situ" treatment of the formation.
3. Place the core specimen into the rubber sleeve. Use the supplied stainless steel spacers to fill in the gaps on the ends of the core inside the rubber sleeve. Allow at most ½" of exposed rubber on each end of the core specimen.



Note

Make sure that the grooves in the spacer are facing the core sample.



Stainless Steel Spacer



Spacer in Sleeve



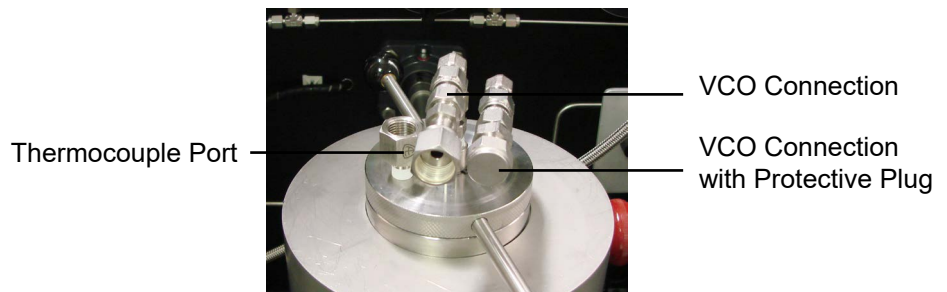
Core in Sleeve

4. Seat the core holder assembly firmly over the post of the bottom pressure head in the core holder.
5. Slowly tighten the top pressure head, making sure it seats into the rubber sleeve. Tighten the assembly firmly to allow the o-ring to seal.
6. Connect the pressure lines to the VCO connectors on the top pressure head.



Note

Make sure the o-rings are in place and in good condition. The connectors that house the o-rings have special caps to protect the o-rings. Remove the caps and keep them in a safe place during testing. They will be needed when testing is complete.



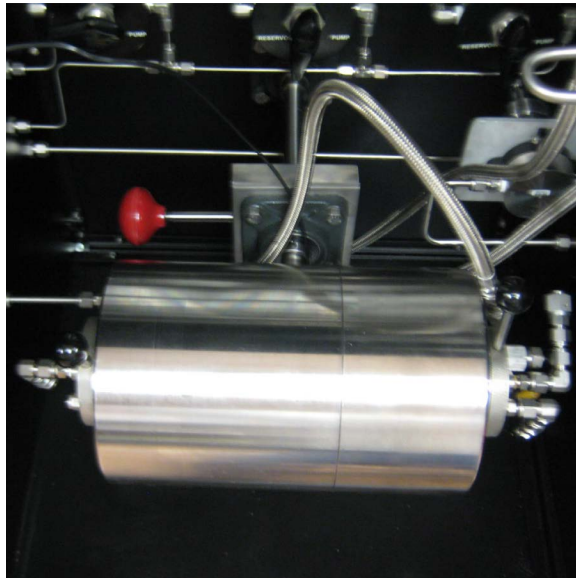
7. Insert the thermocouple into the thermocouple port, but do not tighten it in place yet.

Preparation

Rotating Cell

The Hassler Cell has the ability to be rotated and locked into a 90° angle to simulate horizontal drilling.

1. Turn the red knob counter-clock wise to unlock the cell.
2. Rotate the cell clock-wise until it comes to the 90° stopping point.
3. Turn the red knob clock wise to lock the cell into place.



Preparation

Treating Fluid



This RPT contains three, 1.5-liter stainless steel accumulators. These contain a floating piston which separates the treating fluid from the drive fluid. Correct preparation of the treating fluid will minimize equipment failure and prolong the life of the equipment.

1. Make sure all treating fluids are clean and free of any solids.

Do not put mud into an accumulator.

2. All acids should be inhibited. Do not leave acids in the system for extended periods of time.
3. Before running your first test, designate an accumulator for each type of fluid (brine, hydrocarbon, etc.) to be tested. In each accumulator, use the same type of fluid in every test. This will prevent the different fluids from mixing and adversely affecting the results.
4. Before loading an accumulator, make sure it is empty and that no pressure is on the system.
5. Fill the accumulators using the supplied paint can:



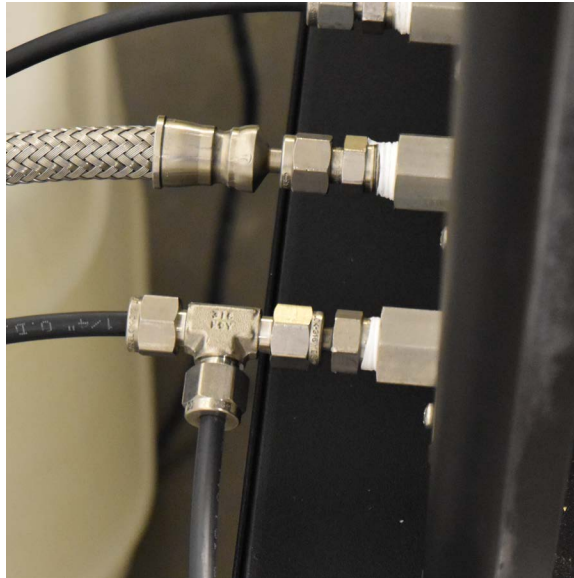
- a. Fill a beaker with approximately 2 liters of treating fluid.
- b. Place the beaker inside the paint can.



- c. Place the lid on the paint can, making sure the dip stick is in the treating fluid.
- d. Tighten all four screws to secure the lid on the can.
- e. Connect the clear hose from the outlet port on the paint can lid to the top port on the accumulator.



- f. Connect the black hose from the inlet port on the paint can lid to the T fitting on the back of the Permeameter.



- g. Turn the top valve on the accumulator to Fill and the bottom valve to Reservoir.

- h. Turn the regulator on the paint can clockwise to add pressure.

Be careful not to add more than 50 lb of pressure to the can.

- i. When filling is complete, back off the regulator and allow the pressure to release.

As the accumulator fills, drive fluid will be pushed into the reservoir. The marks on the side of the reservoir show the level of drive fluid inside. When all three accumulators are full, the drive fluid should reach the top mark.

6. Set both valves on the accumulator to “Off”.

7. Repeat this procedure for each accumulator.



Important



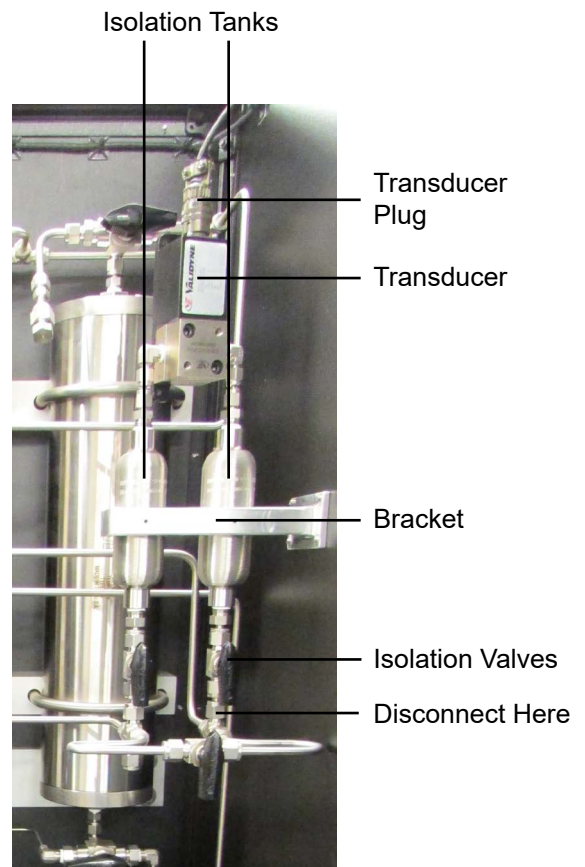
Note

Preparation

Filling the Transducer System

The transducer uses a highly-sensitive electronic pressure diaphragm which can be damaged if corroded by brines or acids and may transmit incorrectly if contaminated with foreign particles. Maintaining a sufficient amount of clean fluid in the isolation system will increase the life of the transducer diaphragm.

1. Make sure no pressure is on the system.
2. Close the two Isolation Valves.
3. Disconnect the fittings below the Isolation Valves.
4. Unscrew and remove the plug for the transducer.
5. With one hand, hold the bracket in place while unscrewing and removing the four screws that secure it to the side panel.
6. Carefully remove the entire transducer system from the cabinet.
7. Turn the transducer system upside down. It may be helpful to secure it with a vise.
8. Open the two Isolation Valves.
9. With a syringe, inject enough glycerin to completely fill both tanks and the plumbing system.
10. Close both Isolation Valves.
11. Turn the transducer system back to the correct orientation.
12. Secure the bracket to the side panel with the four screws you removed earlier.
13. Reconnect the fittings below the Isolation Valves.
14. Screw the plug into the transducer.
15. Keep the Isolation Valves closed until pressure is applied to the system.

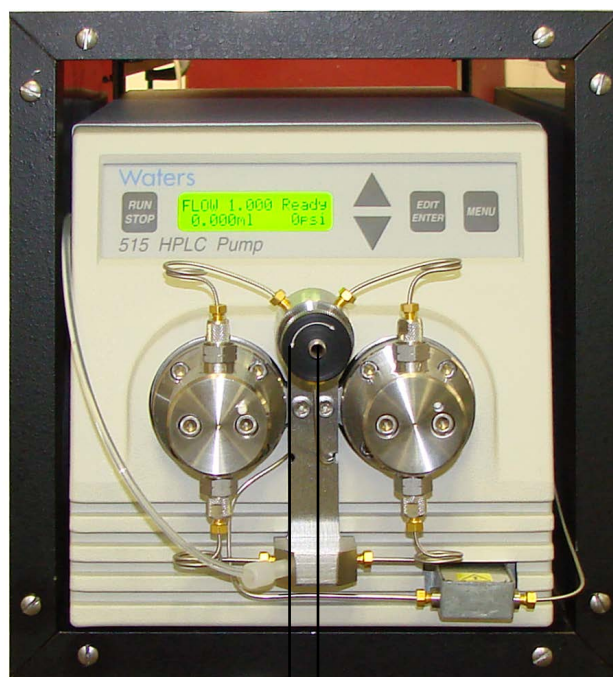


Preparation

Priming the HPLC Pump

Before using the RPT for the first time, you must prime the HPLC pump.

1. Insert an empty syringe into the priming port in the center of the pump.
2. Turn the priming knob counter-clockwise.
3. Pull the plunger of the syringe out until you see fluid enter the syringe. This may take several tries.
4. Remove the syringe and tighten the priming knob.



Priming Port

Priming Knob

Operation

Once the accumulators are full, the core holder is loaded, and the pump is primed, you are ready to begin a test.

1. Turn the "Power" switch on.
2. Set both "Liquid/Gas" valves to the appropriate position, depending on your test.
3. Turn the "Nitrogen" valve on.
4. Set the "Back Pressure" valve to "B.P. Open". Turn the "Nitrogen Regulator" clockwise to set the back pressure high enough to prevent the treating fluid from boiling.
5. Turn the "Back Pressure" valve to "B.P. Lock-in". This will hold the back pressure at the current level throughout the test. The "Nitrogen Regulator" can now be used to control the drive pressure in a gas test.
6. Keep a $\frac{5}{8}$ " wrench handy and turn the "Water" valve on. When water begins leaking from the thermocouple port, quickly tighten the thermocouple completely. This will ensure no air remains inside the core holder.



Note



Important

7. Turn the "Pump Regulator" clockwise to set the confining pressure.

Make sure the "Confining Pressure Release" valve is off.

8. Set the temperature controller to the desired test temperature.

While the core holder is heating, carefully monitor the "Confining Pressure". Bleed any excess pressure by slowly opening the "Confining Pressure Release" valve.

9. Turn the "Air" valve on.
10. If you are running a liquid test, set the pump to the desired flowrate.
 - a. Press the "Edit" button.
 - b. Use the arrow buttons to adjust the flowrate.
 - c. Press the "Menu" button.

11. If you are running a gas test, use the “Nitrogen Regulator” to set the drive pressure.
12. On the accumulator, turn the top valve to “Deliver” and the bottom valve to “Pump”. Both valves should be pointing to the right.
13. Turn the pump on by pressing the “Run/Stop” button.
14. Wait for the treating fluid to drain from the back pressure outlet on the right side of the unit.



Tip

Be sure to have a container under the outlet to catch the fluid as it drains. If you are running a gas test, turn the outlet valve to point to the VCO connection and run a tube into a sealed container. This will prevent treatment fluid from spraying out of the outlet.



Important

Carefully monitor the amount of fluid release through the back pressure outlet. This will tell you how much fluid is left in the accumulator. Be sure to refill the accumulator before it gets empty.

15. Open both “Isolation” valves at the same time.
16. Again, wait for the treating fluid to drain from the back pressure outlet. Close the bypass valve. The “Differential Pressure” indicator will begin displaying the pressure differential.
17. Start the test procedure in the RPT software. See page 25 for instructions.

Operation

Reversing Direction of Flow

For simulated formation treatment the operator may wish to inject treating fluid into one face of the core specimen then reverse the flow into the opposite face. This procedure can be repeated as needed.

1. Turn off the pump.
2. Open the "Bypass" valve to equalize the pressure.
3. Turn the Crossover valve to "Reverse".
4. Close the "Bypass" valve.
5. Turn the pump back on.

Operation

Running Fluids in Series

The RPT is equipped with three accumulators for up to three different treatment fluids. Treatment fluids can be switched during a test as often as needed.

1. Stop the pump.
2. In the RPT software, click the “Stop Run” button.
3. Set both valves on the active accumulator to “Off”.
4. Set the upper valve on the new accumulator to “Deliver”. Set the lower valve to “Pump”.
5. In the RPT software, select the new fluid and click the “Start Run” button.
6. Turn the pump back on.

Operation

Shut-Down Procedure

1. Turn off the pump.
2. Lower the temperature set point to 0. Wait for the system to cool.
3. Slowly turn the “Back Pressure” valve to “B.P. Open”. Turn the “Nitrogen Regulator” counter-clockwise to release the back pressure on the system. Wait for the drive fluid to finish draining from the back pressure outlet.
4. Close both “Isolation” valves.
5. Open the “Bypass” valve.
6. Turn the top and bottom valves on the accumulator to “Off”.
7. Slowly open and close the top and bottom valves on any other accumulators that were used in the test. This will release any remaining pressure in the lines.
8. Turn off the “Water”, “Nitrogen”, and “Air” valves.
9. Slowly open the “Confining Pressure Release” valve.

Be sure to have a container under the outlet to catch the water as it drains.
10. Make sure all gauges read 0 psi before continuing.
11. Slowly unscrew the connections between the pressure lines and the VCO fixtures. Remove the lines and place the protective caps on the ends.
12. Remove the thermocouple from the core holder.
13. Open the core holder.
14. Turn the red knob behind the core holder. This will release the swivel that holds the core holder in place. Tip the core holder to the left and pour out the water into a container.
15. Remove the core from the core holder.



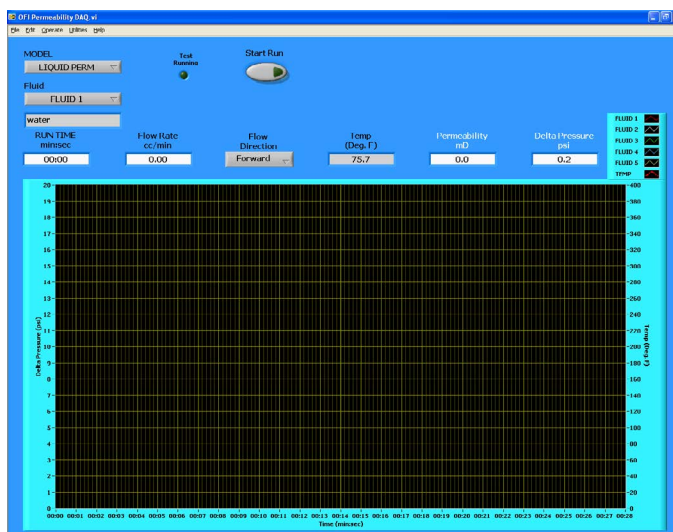
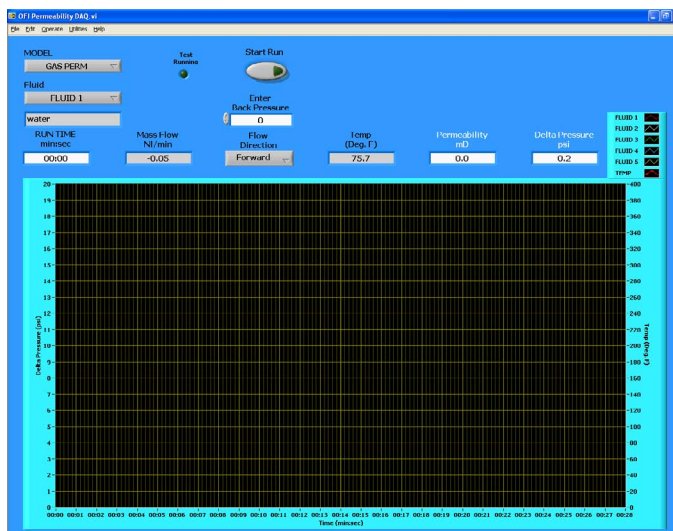
Tip

Software

The OFITE software for the Reservoir Permeability Tester is designed to automatically record the data from a permeability test, graph the results, and store the data for later retrieval.

The software does not control the RPT unit. It performs data acquisition only.

To open the software, double-click the icon on the PC desktop. You will now see the main screen.



Software

Options

To modify the software options, choose “Options” from the “Edit” menu.

“COM PORT” - specifies the port the RPT is connected to

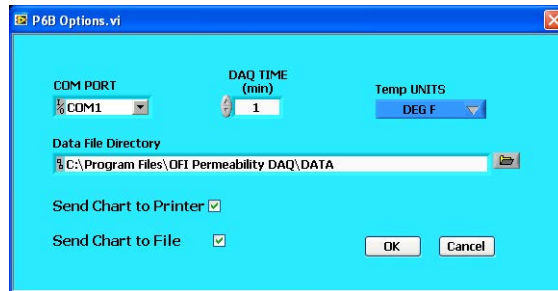
“DAQ Time” - determines how often the software records data

“Data File Directory” - Test data will be stored in this directory.

“Temp Units” - Choose °F or °C.

“Send Chart to Printer” - Check this box if you want charts to be printed to the printer.

“Send Chart to File” - Check this box if you want charts to be saved to a file.



Software

Calibration

The RPT software will only require calibration after a new installation. Otherwise, this procedure is unnecessary.

1. Choose “Calibration” from the “Utilities” menu.
2. Under “Variable” choose “Sample Temp.”
3. Enter the following values and then click the “Store Cal” button.

Value Lo: 0
Sig. Lo.: 0
Value Hi: 200
Sig. Hi: 200

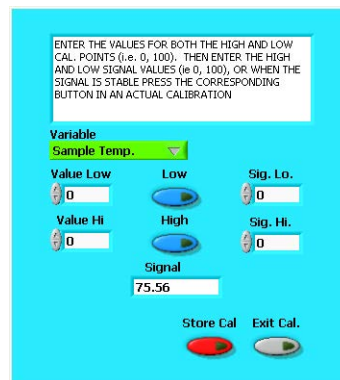
4. Now choose “Mass Flow Rate” from the “Variable” menu and enter these values. Click “Store Cal” when finished.

Value Lo: 0
Sig. Lo.: 4
Value Hi: 9.999
Sig. Hi: 20

5. Now choose “Pressure” and enter these values. Click “Store Cal” when finished.

Value Lo: 0
Sig. Lo.: 0
Value Hi: 200
Sig. Hi: 200

6. Click “Exit Cal” when you have entered all three sets of values.



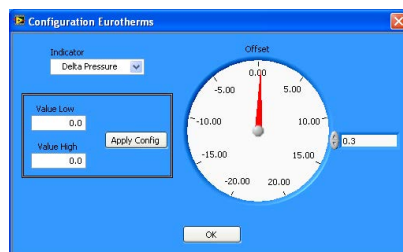
Software

Configuring Eurotherms

Two Eurotherm indicators on the front panel display the “Gas Flow” and the “Differential Pressure”. The “Gas Flow” indicator should read 0 when there is no flow through the system. Likewise, when there is no pressure on the system, the “Differential Pressure” indicator should also read 0. Over time, the readings on these indicators may drift. When that happens, it will be necessary to configure the Eurotherms.

1. Make sure there is no pressure on the system and that the “Air” valve is set to “OFF”.
2. Open both “Isolation” valves and the “Bypass” valve.
3. The “Gas Flow” and “Differential Pressure” indicators should both read 0. If they do not, open “Configure Eurotherms” from the “Utilities” menu in the software.
4. Choose an indicator to configure.
 - a. To configure the “Gas Flow” indicator:
 - i. Choose “Mass Flow”.
 - ii. Adjust the “Offset” value until the “Gas Flow” indicator on the front panel reads 0.
 - b. To configure the “Differential Pressure” indicator:
 - i. Choose “Delta Pressure”.
 - ii. If you have replaced the diaphragm in the transducer, enter the diaphragm minimum and maximum values in the “Value Low” and “Value High” fields and click “Apply Config”. Refer to the diaphragm documentation for these values.

If you have not replaced the diaphragm, do not change the “Value Low” and “Value High” fields.
 - iii. Adjust the “Offset” value until the “Gas Flow” indicator on the front panel reads 0.
5. Click “OK”.



Software Operation

1. When starting a new test, first choose “Load Test” from the “Operate” menu and enter all the appropriate data. The core dimensions, fluid viscosity, and test name are required fields. These must be entered to achieve accurate results. All of the other fields are optional.

2. Prepare the RPT unit according to the directions on page 9.
3. When the unit is ready to begin the test, choose “Start Test” from the “Operate” menu. The file header is optional. Enter a file name and DAQ Time and click “OK”. The software will immediately start recording and the “Test Running” light will come on.

4. You will now be back at the main screen. If you are running a liquid test, make sure the “Model” menu is set to “Liquid Perm”, then enter the flow rate from the pump into the “Flow Rate” field. If you are running a gas test, set the “Model” menu to “Gas Perm” and enter the back pressure into the “Back Pressure” field.
5. When you switch treating fluid or flow direction, click the “Stop Run” button to pause recording. If you are switching fluid, select the new fluid from the drop-down list, then click the “Start Run” button to resume recording. This should all be done while the pump is stopped.
6. When the test is finished, select “End Test” from the “Operate” menu.
7. To access saved data from a previous test, select “Recall Chart” from the “Utilities” menu and choose the file you wish to review.

Appendix

Pressure Testing

The RPT should be hydrostatically pressure tested to 3,000 psi (20.7 MPa) annually. Prolonged use at extreme temperatures and pressures may warrant a shorter time interval.

1. Make sure all valves are closed and all gauges read zero.
2. Disconnect the bottom pressure line from the Crossover valve. Plug the opening on the valve to prevent pressure from escaping.
3. Turn the “Air” valve on.
4. Choose a filled accumulator and set the top valve to “Deliver” and the bottom valve to “Pump”.
5. Turn on the pump.
6. Allow the drive pressure to reach 3,000 psi (20.7 MPa), then turn off the pump.
7. Check for leaks throughout the system.
8. If no leaks are present, slowly and carefully release the pressure and reconnect the pressure line to the 4-way valve.



Appendix

Calculations

Once the test has been completed, the data collected is used in Darcy's equation for gas permeability:

$$K = \frac{\mu \times Q \times L}{A \times (P_1 - P_2)}$$

For this equation, "K" is measured in darcies and P_1 and P_2 in atmospheres of pressure. To simplify the equation for direct data input the following equation is used:

$$K_{md} = \frac{14,700 \times \mu \times Q \times L}{A \times P}$$

Where:

- K_{md} = Permeability (millidarcies)
- μ = Viscosity of treating fluids (centipoise)
- Q = Flow Rate (cc/sec)
- L = Core Length (cm)
- A = Cross sectional area of the specimen (πr^2)
- P = Differential pressure (psi)

At constant flow rate and outlet pressure the only data point that needs to be plotted is the differential pressure.

Appendix

Cleaning

1. Fill the rubber sleeve with stainless steel spacers and load it into the core holder. Close the core holder and connect the pressure lines.
2. Turn the power on.
3. Make sure the back pressure is set to zero. Turn the “Air” valve on.
4. Start with the first accumulator. Turn the top valve to “Deliver” and the lower valve to “Pump”.
5. Close both “Isolation” valves and open the “Bypass” valve.
6. Set the Crossover valve to “Forward”.
7. Turn on the pump.



Tip

Be sure to have a container under the back pressure outlet to catch the treating fluid as it drains.

8. When the first accumulator is empty, turn off the pump and repeat this process with the other two accumulators.
9. When all three accumulators are empty, turn off the pump.
10. Using the supplied piston metering pump, fill each accumulator with fresh water.



Note

For accumulators that have held acids, use 1% sodium bicarbonate solution.

11. Purge the accumulators of the cleaning fluid as described above.

Appendix

Storing the RPT

1. The instrument should be stored completely assembled.
2. The HPLC pump should be primed with isopropanol.
3. Store the instrument in a non-corrosive environment.
4. All systems in the RPT should be clean and free of any corrosive fluids or particles before storing the apparatus for any extended length of time

Appendix

Adjusting the Casters

1. Pull out latch.
2. Push the switch above the latch towards the right to engage the ratchet.
3. Ratchet the caster to the right to lower the rubber feet and lock it in place.
4. Push the switch to the left to disengage the ratchet.
5. Ratchet the caster to the left to raise the caster.
6. Push the latch back in to secure its position.

Left - Raise



Right - Lower



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.