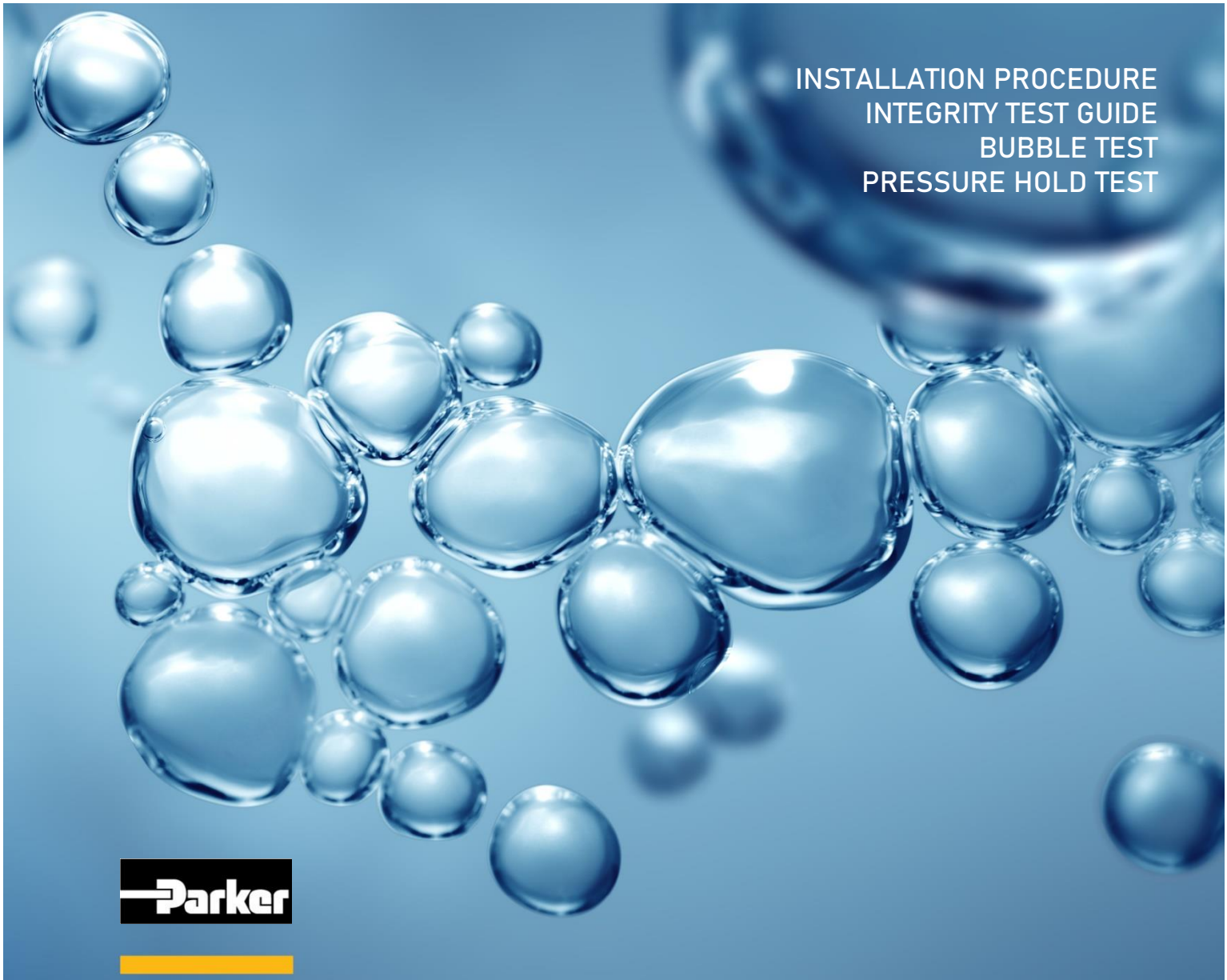

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CLARIFLOW®-SELECT

PES (POLYETHERSULFONE) SELECT-PLEATED MEMBRANE MICROFILTER CATRIDGE WITH POLYPROPYLENE STRUCTURE

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CLARIFLOW-SELECT

The enclosed Clariflow-SELECT filter cartridge is fabricated from a PES (Polyethersulfone) microporous membrane and a polypropylene structure. The membrane is SELECT-Pleated; Parker Hannifin's unique proprietary pleating process which has much less pleat outlet restriction and results in an increase in flow rate and throughput over conventional pleated cartridges.

Clariflow-SELECT cartridges are manufactured from PES microporous membrane which is pleated using SELECT-Pleating, together with its woven polypropylene monofilament support screens, up and downstream of the membrane, to form a pleat pack. The pleat pack is thermally bonded to polypropylene structural components consisting of the core, endcaps and guard.

SELECT-Pleating utilizes blocks of pleats with each block having four pleats of decreasing heights. All pleats are in contact with the guard at the OD of the cartridge, but only one pleat of every block touches the core. This leaves a large cavity on the downstream side of every block and opens up the downstream flow pattern, much reducing the downstream restriction to flow normally found on standard, closely packed- pleated filter cartridges.

Any liquid that wets the filter may be used to perform the test. At Parker Hannifin, the solution used is a 60/40 IPA/water solution because of its superior wetting properties. However, water can be used and even the chemical which is to be filtered. The test is essentially a leak test and may be performed at the start, during or end of the process.

Performing the test in the process housing also detects an O-ring failure.

NOTE: A very similar test employing higher pressures is used by filter manufacturers to approximate the sizes of the pores within membranes used to manufacture cartridges. In this test, the pressure is raised to higher pressures until it overcomes the surface tension of the very small pores in the membrane. This test is called the Bubble Point Test. The test assures that the pore structure of the membrane corresponds with requirements for a cartridge's desired performance characteristics.

Because the surface tension of an alcohol / water mixture is lower than for pure water, less force is needed to expel the mixture from the filter than for water. Accordingly, care is taken to use lower pressure values when using an IPA/water solution than for water.

BUBBLE TEST PROCEDURE
(Optional)

NOTE: If the test is to be run during or at the end of the process, see the procedure:
IN-PROCESS BUBBLE TESTING.

1. Install a test valve on a line (1/4" or 1/8") leading from either the downstream piping or connected to the housing's downstream vent port. The other end of this line is either immersed in a liquid or the tube may have a trap containing liquid. The trap is transparent to enable observation of bubbling.
2. Connect an N2 line between the inlet process valve and the upstream side of the filter. The upstream vent port may be used for this purpose.
3. Install the cartridge in the housing if it hasn't yet been installed.
4. Pre-wet the cartridge either by letting it soak for five minutes, open end up, in a container high enough to submerge the entire cartridge, or by installing the cartridge in the housing and running either water or chemical through it. The cartridge MUST be completely wetted. The inlet and outlet process valves are closed.
5. Drain the housing through the drain port. A vent on the upstream side must be open.
6. Close the drain port.
7. Open the test valve.
8. Open the N2 valve and pressurize to between 5-10psig (350-700mbar).
9. Observe the submerged outlet for signs of continued bubbling. An initial surge of bubbles is normal. Look for continued bubbling that would indicate N2 passage. Should bubbling continue, shut down and examine the O-ring for imperfections.
10. If the cartridge appears to be normal, set it aside for later use and use another cartridge. Re-wetting a partially-wetted cartridge may not work due to the entrapment of air within the membrane structure. Pre-wetting requires starting with a dry cartridge.

IN-PROCESS BUBBLE TESTING

NOTE: The filter contains chemical or water.

1. Follow instructions 1 and 2 of BUBBLE TEST PROCEDURE.
2. Close the inlet process valve. The outlet process valve remains open.
3. Open the N2 valve and pressurize to between 5-10psig (350-700mbar).
4. The gas will drive the liquid in the housing out through the outlet process valve.
5. When the process liquid has been purged, open the test valve.
6. Observe the submerged outlet for signs of continued bubbling. An initial surge of bubbles is normal. Look for continued bubbling that would indicate N2 passage.

NOTE: Should the chemical have a low surface tension, bubbling could occur through an integral membrane. If this occurs, use a lower test pressure.

PRESSURE HOLD TEST
(Optional)

This test may be used when observation of downstream passage of gas is not practical. It entails observing the decay of gas pressure upstream of the cartridge should a bypass or failure exist.

1. Connect an N2 line between the inlet process valve and the upstream side of the filter. The upstream vent port may be used for this purpose.
2. Pre-wet the cartridge as discussed in the two prior integrity test procedures.
3. Install the cartridge in the housing if it hasn't yet been installed.
4. Open a downstream valve to allow for any leakage of gas.
5. Open the valve of an N2 line connected to the upstream side of the filter, pressurize to between 5-10psig (350 - 700mbar), and then CLOSE the N2 valve.
6. Observe the upstream gas pressure for 10 minutes for any sign of a loss of pressure. The decay in pressure can be interpreted as a bypass or failure. A small amount of gas passage is normal and the upstream pressure will decay very slowly. This is due to diffusion; the N2 gas dissolves in the wetting liquid and diffuses through the membrane structure to the downstream side. Called diffusive flow, it is slow (as compared to flow through a defect) and a small amount is to be expected.

7. Should a greater pressure decay occur than that which can be attributed to diffusion, the test should be repeated. Follow the instructions for re-wetting the cartridge.

   Caution must be taken not to allow the filter cartridge to dry.

NOTE: Only nitrogen or air should be used for integrity testing. In some instances, an availability of CO2 makes its use tempting. However, due to the high solubility of CO2 in water, diffusion is greatly increased and may result in false positive test results.

INSTALLATION PROCEDURE

1. Cut open the bag at the end nearest the O-rings.
2. Lubricate the O-rings with chemical or water (optional).

3. Holding the filter cartridge by means of the bag, insert the endcap with the O-rings into the housing using a slight twisting motion.

Remove the bag and assemble the housing.

INTEGRITY TESTING (Optional)

An integrity test is a non-destructive test that may be performed on a filter to assure that no bypass exists that could impact its effectiveness. This could be a tear in the media or even a cut O-ring. The test may be run at any time before, during, or after the filter is used.

Every Clariflow-SELECT are tested by Parker Hannifin in accordance with the Quality Assurance Program. Accordingly, integrity testing by the user may be considered optional.

The principle of the Bubble Test is quite simple. Due to surface tension, a wet membrane retains liquid within its pores as well as in any cracks or tears that may exist in the membrane. By exposing the upstream side of the filter to nitrogen, even at low pressure, the force on the much larger cracks, tears or other bypasses, is significantly greater than on the membrane's pores, and the liquid will be expelled from the tears, followed by the gas.

By observing the outlet of the filter housing for a stream of continuous bubbles, the test is useful in detecting non-integral cartridges before they can be used. A test pressure, normally between
5 -10psig (350 - 700mbar) is recommended.

For the successful performance of the test, the filter's membrane must be wetted completely. Dry regions, no matter how small, can be detected as failures. Should a failure be indicated at the start, it is recommended that the filter be completely dried and later re-wet. This also applies to filters that may have lost water due to evaporation.