

WHAT IS CLAIMED IS:

1. AUse of a radial seal in a filtration system, comprising at least one annulus defined by an outer circumference and an inner circumference and a thickness and having:
 - a diameter of the inner circumference that is selected to fit in a groove in an outer surface of a seal plate;
 - a diameter of the outer circumference that is selected to be larger than the diameter of an inner surface of a cylindrical housing that receives the seal plate;
 - a gap in the at least one annulus and centered along a radius of the at least one annulus, wherein the gap has a width selected to enable the annular element to deform sufficiently to permit insertion of the at least one annulus into the cylindrical housing, wherein
 - the inner and outer diameters of the at least one annulus and the width of the gap are selected to obtain a tight fit between the outer circumference of the at least one annulus and the inner surface of the cylindrical housing.
2. The ~~seal~~use of claim 1, wherein the tight fit is maintained by a desired restoring force reactive to compression of the annular element, wherein the magnitude of the restoring force is related to the width of the gap and the materials used to fabricate the at least one annulus.
3. The ~~seal~~use of claim 2, wherein the width of the gap is selected to permit a maximum leakage when the at least one annulus is installed in the groove and the seal plate is inserted in the cylindrical housing.
4. The ~~seal~~use of claim 3, wherein the seal comprises a plurality of annuli, wherein the annuli are configured such that the gaps of the annuli are misaligned when the annuli are installed in the groove, thereby minimizing leakage in operation.
5. The ~~seal~~use of claim 4, further comprising a registration system, wherein each annulus in a pair of adjacent annuli includes a registration element that cooperates with a registration element of the other annulus to ensure misalignment of the gaps of the pair of annuli.

6. The ~~seal~~use of claim 5, wherein the registration system comprises a raised element provided on a surface of one of pair of annuli that fits in the gap of an adjacent annulus.
7. The ~~seal~~use of claim 5, wherein the registration system comprises a raised element provided on a surface of one of pair of annuli that fits in a groove provided on a surface of an adjacent annulus.
8. The ~~seal~~use of claim 1, wherein the gap is formed in an annulus by providing two ends of the annulus centered on, and formed at an angle to, a radius of the annulus, wherein both ends of the annulus intersect the radius.
9. The ~~seal~~use of claim 1, wherein the gap has a stepped profile.
10. A method of sealing a spiral membrane element configured to be inserted into a cylindrical housing of a filtration system, comprising:
 - providing at least one split ring seal in a groove located on an outer surface of a seal plate of the spiral membrane element, wherein the split ring seal has an outer diameter exceeding the diameter of an inner surface of the cylindrical housing; and
 - inserting the seal ring into the cylindrical housing, wherein inserting the seal ring includes a step of compressing the at least one split ring seal, wherein
 - a gap in the split ring has a width selected to enable the annular element to deform in response to the compressing step sufficient to enable the at least one split ring seal to fit within the cylindrical housing.
11. The method of claim 10, wherein the width of the gap is selected to permit a maximum degree of leakage when the at least one annulus is installed in the groove and the seal plate is inserted in the cylindrical housing.
12. The method of claim 10, wherein the at least one split ring seal comprises a plurality of split ring seals.
13. The method of claim 12, further comprising the step of aligning each of the plurality of split ring seals to avoid an overlap of gaps of adjacent split rings, thereby minimizing leakage in operation.

14. The method of claim 13, wherein the step of aligning includes using registration elements provided on each split ring seal to configure the alignment of adjacent pairs of split ring seals.

15. The method of claim 14, wherein the registration elements include one or more of a groove, a pin, a hole and a slot.

16. ~~A~~Use of a split-ring seal for maintaining a seal between a filtration element and a housing of a filtration system, comprising a rigid annulus having a discontinuity therein, wherein:

the annulus has an inner diameter selected to allow the annulus to fit a groove provided in an outer surface of the filtration element;

the annulus has an outer diameter is selected to be larger than the diameter of an inner surface of the housing;

the discontinuity accommodates a reduction of inner and outer diameters of the annulus in response to a compressive force received during insertion of the filtration element into the housing; and

the annulus is configured to resist changes in its cross-sectional profile in response to the compressive force.

17. ~~The split-ring seal use~~ of claim 16, wherein the discontinuity comprises a step shaped channel in the annulus wherein the step shaped channel is substantially closed under pressure of an axial flow of fluid through the filtration system.

18. ~~The split-ring seal use~~ of claim 16, wherein the discontinuity is formed by the overlap of two step shaped ends formed in the annulus.

19. ~~The split-ring seal use~~ of claim 16, wherein the annulus is configured to maintain the seal between the filtration element and the housing and to resist an axial flow of fluid through the filtration system regardless of direction of the axial flow.

20. ~~The split-ring seal use~~ of claim 16, wherein:

during filtration the seal operates to resist bypass of a fluid around the filtration element and into a space between the filtration element and the housing; and

during cleaning, the seal operates to resist bypass of a flushing fluid around the filtration element and into the space between the filtration element and the housing.

21. The ~~seal~~use of claim 1, wherein the annulus is constructed from a non-elastomeric material.

22. The ~~seal~~use of claim 21, wherein the non-elastomeric material is selected from a group consisting of hard and/or hardened polymers, metal , and ceramics.

23. The method of claim 10, wherein the split ring seal is constructed from a non-elastomeric material.

24. The method of claim 23, wherein the non-elastomeric material is selected from a group consisting of hard and/or hardened polymers, metal, and ceramics.

25. The ~~split-ring seal~~use of claim 16, wherein the split-ring seal is constructed from a non-elastomeric material.

26. The ~~split-ring seal~~use of claim 25, wherein the non-elastomeric material is selected from a group consisting of hard and/or hardened polymers, metal , and ceramics.

27. A filtration system comprising spiral membrane elements inserted into a cylindrical housing, wherein the spiral membrane element has a radial seal of claim 1 or a split-ring seal of claim 16, and the spiral membrane element can be moved along an axis of the cylindrical housing in either direction without destruction of the radial seal or the split-ring seal.

28. The method of claim 10, wherein the spiral membrane element is configured to be inserted into either end of the cylindrical housing of the filtration system and to be moved along an axis of the cylindrical housing in either direction.