CLAIMS

1 . A refractometer for a single use system, the refractometer comprising:

an enclosure, the enclosure defining an interior chamber;

a single use prism, the single use prism removably disposed within the interior chamber of the enclosure, the single use prism including a body made from an optically transmissive material, the body including a light-accepting surface, a light-refracting surface, and an interface surface, the light-accepting surface and the light-refracting surface being generally planar, the interface surface defining a cylindrical passage formed within the body and extending along a longitudinal axis through the body, the passage has a passage radius R_1;

a light source, the light source disposed within the enclosure such that the light source is configured to selectively emit light in a light path emanating from a location external to the single use prism, the light path extending from the light source through the light-accepting surface of the single use prism to the interface surface, the light path being substantially perpendicular to the light-accepting surface and to the longitudinal axis of the passage, the light path has a light path diameter D_2;and

an index of refraction (IoR) sensor, the IoR sensor disposed within the interior chamber of the enclosure such that the IoR sensor is configured to detect total internal reflection light that reflects from the light path at the interface surface and passes through the light-refracting surface of the single use prism, the IoR sensor being configured to generate an IoR signal indicative of the total internal reflection light the IoR sensor detects,

wherein the light path diameter D_2 is nominally equal to the passage radius R_1.

2. The refractometer according to claim 1, wherein the body of the single use prism is made from an optically transmissive material that is resistant to irradiation during sterilization of the single use prism.

3. The refractometer according to claim 2, wherein the optically transmissive material comprises a polymer.

4. The refractometer according to any one of claims 1 to 3, wherein the light-accepting surface, the light-refracting surface, and the interface surface of the body of the single use prism each has a surface finish value equal to or less than 0.1 Ra μm.

5. The refractometer according to any one of claims 1 to 4, wherein the light emitted by the light source is monochromatic.

6. The refractometer according to claim 5, wherein the light source comprises a monochromatic laser module adapted to emit a collimated laser beam.

7. The refractometer according to any one of claims 1 to 6, wherein the single use prism is removably disposed within the interior chamber of the enclosure such that the light source is disposed in non-contacting relationship with the single use prism.

8. The refractometer according to any one of claims 1 to 7, wherein the IoR sensor comprises a linear optical array positioned substantially parallel to the light-refracting surface of the single use prism.

9. The refractometer according to any one of claims 1 to 8, wherein:

the enclosure defines a prism opening and first and second sample ports, the prism opening and the first and second sample ports in communication with the interior chamber,

the body of the single use prism includes first and second side surfaces, the first and second side surfaces disposed in lateral spaced relationship to each other, the first and second side surfaces each including first and second side edges, the light-accepting surface extending between the first side edges of the first and second side surfaces, and the light-refracting surface extending between the second side edges of the first and second side surfaces, the first and second side surfaces respectively defining first and second passage openings, and

the single use prism includes first and second fittings attached to the body such that the first and second fittings are respectively mounted to the body such that the first and second fittings are in respective communication with the first and second passage openings, the first and second fittings being accessible from the exterior of the enclosure via the first and second sample ports.

10. The refractometer according to any one of claims 1 to 9, further comprising:

a control unit, the control unit including a processor and a non-transitory computer readable medium bearing an IoR program, the processor being in electrical communication with the IoR sensor to receive the IoR signal therefrom, the processor programmed with the IoR program, the IoR program having a characteristic determination module configured to determine a value of a characteristic of a fluid passing through the passage of the single use prism based upon the IoR signal.

11. A method of using a refractometer, the method comprising:

(i) removably installing a single use prism in an interior chamber of an enclosure, the single use prism made from an optically transmissive material, the single use prism including a body having a light-accepting surface, a light-refracting surface, and an interface surface, the light-accepting surface and the light-refracting surface being generally planar, the interface surface defining a cylindrical passage formed within the body extending along a longitudinal axis though the body, the passage has a passage radius R1;

(ii) passing a fluid through the passage of the single use prism;

(iii) directing a light path from within the interior chamber external to the single use prism through the light-accepting surface of the single use prism to the interface surface, the light path being substantially perpendicular to the longitudinal axis of the passage, the light path has a light path diameter D_2;

(iv) detecting total internal reflection light from the light path that is reflected at the interface surface and passes through the light-refracting surface of the single use prism;

(v) generating an IoR signal indicative of the total internal reflection light detected;

(vi) determining a value of a characteristic of the fluid based upon the IoR signal;

(vii) removing the single use prism from the enclosure,

wherein the light path diameter D2 is nominally equal to the passage radius R1.

12. The method according to claim 11, the method further comprising:

prior to removably installing the single use prism in the interior chamber of the enclosure, sterilizing the single use prism by irradiating the single use prism, the single use prism being optically transmissive after the single use prism is sterilized by being irradiated.

13. The method according to claim 14, wherein the single use prism comprises a first single use prism, the method further comprising:

sterilizing a second single use prism by irradiating the second single use prism, the second single use prism being a separate component from the first single use prism but constructed in the same manner as the first single use prism;

after being sterilized, removably installing the second single use prism in the interior chamber of the enclosure;

repeating (ii)-(vii) of claim 11 with the second single use prism.