What is claimed is:

1. An electrode unit for use in a fryer system configured to measure cooking medium quality, the electrode unit comprising:

an electrode plate comprising a first side and a second side opposite the first side, the electrode plate configured to be completely immersed in cooking medium, the electrode plate having a height, a width, and a thickness;

an insulator having a first side formed on the first side of the electrode plate and covering a surface of the electrode defined by the height and the width, the insulator having a second side configured to attach to a cooking vessel of the fryer system;

a guard ring configured to attach to the cooking vessel of the fryer system and surrounding the electrode plate and the insulator, wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate and the insulator in the height and the width directions, wherein a size of the gap sets an electrode gain of the electrode plate, the guard ring configured to extend further from the cooking vessel than the electrode plate and the insulator ~~is based on the height, width, and thickness of the electrode plate, and the gap substantially defines a gain of the electrode~~; and

the second side of the electrode plate ~~is~~ having a smooth ~~polished~~ surface.

2. The electrode unit of claim 1 , further comprising:

a signal conditioning circuit configured to receive a signal from the electrode plate, and configured to measure the conductivity of the cooking medium ~~in which~~when the electrode plate is completely immersed ~~based on the received signal~~therein.

3. The electrode unit of claim 1 , wherein the height of the electrode plate is 1.905 cm, and the width of the electrode plate is 5.08 cm.

4. The electrode unit of claim 3, wherein the gap is 0.424 cm from each side of the electrode plate to its corresponding side of the guard ring.

5. The electrode unit of claim 4, wherein the insulator thickness is 0.2362 cm and the electrode plate thickness is 0.2667 cm.

6. The electrode unit of claim 5, wherein the guard ring is configured to extend into the cooking vessel ~~extends~~ 0.145 cm beyond the electrode plate.

7. The electrode unit of claim 6, wherein the guard ring has a thickness of 0.2667 cm.

8. The electrode unit of claim 1 , wherein the guard ring comprises an electrically conductive stainless steel.

9. The electrode unit of claim 8, wherein the insulator comprises PTFE.

10. A~~n~~ fryer configured to measure cooking medium quality ~~within the fryer~~, the fryer comprising:

a cooking vessel configured to store a cooking medium;

an electrode plate ~~completely immersed in the cooking medium~~within the cooking vessel;

an insulator comprising a first side and a second side opposite the first side, wherein the first side of the insulator is fixed to a particular side of the electrode plate, and a second side of the insulator is attached to a wall of the cooking vessel;

a guard ring fixed to the cooking vessel and surrounding the electrode plate and the insulator, wherein the guard ring extends further away from the wall of the cooking vessel than the

insulator and the electrode plate, and wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate, wherein a size of the gap ~~is based on a height, a width, and a thickness of the electrode plate, and the gap substantially defines~~ sets an electrode gain of the electrode plate; and

a signal conditioning circuit ~~that measures~~configured to measure the conductivity of the cooking medium when applied to the electrode plate.

11. The fryer of claim 10, wherein the electrode plate comprises a further side opposite the particular side, and the further side of the electrode plate ~~is~~ has a ~~polished~~ smooth surface.

12. The fryer of claim 10, further comprising:

a seal washer positioned on an opposite side of the wall of the cooking vessel from the insulator and configured to prevent cooking medium from escaping the cooking vessel at the electrode plate;

a seal compression washer positioned on the opposite side of the wall of the cooking vessel and configured to compress the seal washer against the opposite side of the wall of the cooking vessel; and

a back insulator positioned on the opposite side of the wall of the cooking vessel, wherein the back insulator covers the seal compression washer and is aligned with the insulator.

13. The fryer of claim 12, further comprising a bolt threaded through the electrode plate, the insulator, the wall of the cooking vessel, the seal washer, the seal compression washer, and the back insulator.