CLAIMS

What is claimed is:

1. A well safety valve, comprising:

a first sub assembly, wherein the first sub assembly comprises:

an outer housing having a central bore extending axially through the outer housing, wherein the outer housing comprises an outer wall having a receptacle formed in the outer wall;

a piston disposed in the receptacle, wherein the piston is actuable to travel longitudinally in the receptacle;

a rod, wherein the rod is disposed at an end of the piston, wherein a first magnetic sleeve is disposed around the rod, the first magnetic sleeve comprising a solid annular cross-section;

a flow tube disposed in the central bore of the outer housing, wherein the flow tube comprises a second magnetic sleeve on an exterior surface of the flow tube, wherein the flow tube is operable to move in response to movement of the piston;

a valve member disposed in the outer housing, wherein the valve member is operable to selectively restrict flow through the well safety valve in response to movement of the flow tube; and

one or more magnetic sensors disposed in the outer housing between the first magnetic sleeve and the second magnetic sleeve; and

a second sub assembly, wherein the second sub assembly is coupled to the first sub assembly.

2. The well safety valve of claim 1, wherein the valve member comprises a flapper valve.

3. The well safety valve of claim 2, further comprising a flapper assembly, wherein the flapper assembly comprises a hinge, wherein the flapper valve rotates about the hinge.

4. The well safety valve of claim 1, wherein the one or more magnetic sensors comprises a plurality of magnetic sensors spaced longitudinally in the outer housing between the piston and the flow tube.

5. The well safety valve of claim 4, wherein the plurality of magnetic sensors are disposed equidistant from each other.

6. The well safety valve of claim 4, further comprising a control module in signal communication each one of the plurality of magnetic sensors, wherein the control module is configured to:

operate each one of the plurality of magnetic sensors to receive a nearby magnetic field as a signal;

process the signal; and

convey the signals uphole to an information handling system.

7. The well safety valve of claim 4, further comprising a plurality of control modules, wherein each individual one of the plurality of control modules is coupled to an individual one of the plurality of magnetic sensors, wherein each control module is configured to:

operate the individual one of the magnetic sensors to receive a nearby magnetic field as a signal;

process the signal; and

convey the signals uphole to an information handling system.

8. The well safety valve of claim 1, wherein the one or more magnetic sensors are selected from the group consisting of a Hall effect sensor and a reed switch.

9. A method of monitoring a position of a flow tube in a safety valve, comprising:

displacing a piston and a rod, wherein the rod is coupled to the piston, wherein a receptacle is formed in an outer wall of an outer housing of the safety valve, wherein the piston and the rod are disposed within the receptacle;

displacing a flow tube, with a first magnetic sleeve comprising a solid annular cross-section, in response to the displacement of the piston and the rod;

monitoring the position of the flow tube with at least one of one or more magnetic sensors or a piezoelectric sensor; and

actuating a valve member.

10. The method of claim 9, wherein displacing the piston and the rod is in response to a change in hydraulic pressure provided to the safety valve from a surface of a wellbore.

11. The method of claim 9, wherein displacing the piston and the rod is in response to an electrical signal provided to the safety valve from a surface of a wellbore.

12. The method of claim 9, wherein the safety valve comprises a first sub assembly coupled to a second sub assembly, wherein the piezoelectric sensor is disposed at an internal shoulder of an end of the second sub assembly, and further comprising seating the flow tube against the piezoelectric sensor.

13. The method of claim 9, wherein the safety valve comprises an outer housing having a central bore extending axially through the outer housing, wherein the outer housing comprises an outer wall having a receptacle formed in the outer wall, wherein the piezoelectric sensor is disposed within a portion of the outer housing between the receptacle and the flow tube, and further comprising seating the rod against the piezoelectric sensor.

14. The method of claim 9, wherein the safety valve comprises an outer housing having a central bore extending axially through the outer housing, wherein the outer housing comprises an outer wall having a receptacle formed in the outer wall, wherein the one or more magnetic sensors are disposed within a portion of the outer housing between the receptacle and the flow tube, and further comprising measuring a magnetic field produced by a first magnetic sleeve disposed on the rod and a second magnetic sleeve disposed on the flow tube with the magnetic sensor.

15. A well safety valve, comprising:

a first sub assembly, wherein the first sub assembly comprises:

an outer housing having a central bore extending axially through the outer housing, wherein the outer housing comprises an outer wall having a receptacle formed in the outer wall;

a piston disposed in the receptacle, wherein the piston is actuable to travel longitudinally in the receptacle;

a rod~~, wherein the rod is~~ disposed at an end of the piston, wherein a first magnetic sleeve is disposed around the rod, the first magnetic sleeve comprising a solid annular cross-section;

a flow tube disposed in the central bore of the outer housing, wherein the flow tube is operable to move in response to movement of the piston; and

a valve member disposed in the outer housing, wherein the valve member is operable to selectively restrict flow through the well safety valve in response to movement of the flow tube;

a second sub assembly, wherein the second sub assembly is coupled to the first sub assembly; and

a piezoelectric sensor positioned to measure a position of the flow tube in the well safety valve.

16. The well safety valve of claim 15, wherein the piezoelectric sensor is disposed at an internal shoulder of an end of the second sub assembly.

17. The well safety valve of claim 16, wherein the piezoelectric sensor is configured to be actuated by displacement of the flow tube, wherein the flow tube is able to seat against the piezoelectric sensor.

18. The well safety valve of claim 15, wherein the piezoelectric sensor is disposed within a portion of the outer housing between the receptacle and the flow tube.

19. The well safety valve of claim 18, wherein the piezoelectric sensor is configured to be actuated by displacement of the rod, wherein the rod is able to seat against the piezoelectric sensor.

20. The well safety valve of claim 15, wherein the piezoelectric sensor comprises a control module, wherein the control module is configured to:

convert a change in strain due to an applied force to an electrical signal; and

convey the electrical signal uphole to an information handling system.