Response time, stirring sensitivity, and signal to noise ratio

There is a relationship between response time, stirring sensitivity and signal to noise ratio of a sensor.

Modeling shows that for an ideal sensor the **stirring sensitivity** can be approximated by R/4L, where R = radius of the hole in the sensor tip and L = distance from the tip to the cathode.

The **response time** is proportional to L squared (L^2). Thus a fast responding sensor has a very small L.

In order to reduce the relative noise (= low noise to signal ratio, high **signal to noise ratio**) a large signal is an advantage. A large signal also offers better resolution of the measurement. The signal is proportional (rough calculation) to R^2/L (R squared divided with L). Thus sensors with a large R and a small L give the highest signal to noise ratio.

Examples:
A sensor with a fast response and still a low stirring sensitivity have to have a small signal
A sensor with fast response but higher stirring sensitivity allow us to produce them with higher signals (offering better resolution).

For general purpose use we make sensors with a stirring sensitivity of <2% and a response time of <3 s, which is a good compromise for most users. We can however construct microsensors with any requested performance. For example. we can make OX10 sensors with a response time of less than 0.1s.