shown in the figure below:

More information about the Microflown devices, their uses and applications as well as many interesting and useful educational/technical documents can be found on Microflown's website: http://www.microflown.com.

Absolute calibration of a particle velocity microphone/measurement of the sensitivity of the particle velocity microphone S_{mic} is again carried out by placing it *e.g.* in a monochromatic (*e.g.* *f* = 1.0 *KHz* sine-wave) ***free-air*** sound field $\tilde{S}(\vec{r},t)$ at *NTP* with a *SPL* = 94.0 *dB* {set using *e.g.* a NIST-calibrated *SPL* meter (*C*-weighting) in proximity to the microphone}. As mentioned above, this *SPL* corresponds to an over-pressure amplitude of $p = 1.0\ Pascals$, since $SPL(dB) = 20\log_{10}(p/p_0)$ where $p_0 = 2\times10^{-5}\,Pa$ is the reference pressure at the (average) threshold of human hearing. However, for a free-air sound field with ***purely-real*** longitudinal ***specific characteristic*** acoustic impedance $z_o = \rho_o c = p/u \simeq 413\,\Omega_a$, a *SPL* = 94.0 *dB* free-air sound field has a ***purely-real*** over-pressure amplitude of $p = 1.0\ Pascals$ and also has a ***purely-real*** particle velocity amplitude of $u = p/z_o \simeq 1.0/413 = 2.42\times10^{-3}\ m/s = 2.42\,mm/s$. The *AC* voltage amplitude V_{u-mic} output from the particle velocity microphone immersed in a *SPL* = 94.0 *dB* free-air sound field can be easily measured *e.g.* using an oscilloscope or a true *RMS* digital multi-meter.

If the measured *AC* voltage amplitude output from a particle velocity microphone immersed in a *SPL* = 94.0 *dB* free-air sound field is $V_{u-mic} = xx.x\ mV$, the ***sensitivity*** of this particle velocity microphone is thus: $S_{u-mic} \equiv V_{u-mic}/u = xx.x\ mV/2.42\,mm/s = xx.x/2.42\ \ mV/(mm/s)$

Appendix A: Forces Acting on a Microphone Diaphragm:

There is almost always more than ***just*** the force associated with an over-pressure $\vec{\tilde{F}}_{pressure}(t) \simeq \tilde{p}_o\vec{A}_{dia}e^{i\omega t} = \tilde{p}_o A_{dia}e^{i\omega t}\hat{n}$ acting on the diaphragm of a microphone. In general, there can be (*a*.) ***velocity-dependent*** force(s) associated with dissipative/viscous/frictional processes – *i.e*. force term(s) of the form $\vec{\tilde{F}}_{dissipate}(t) = -m_{dia}\gamma_{dia}\vec{\tilde{v}}_{dia}(t)$ that oppose the driving motion, where the so-called damping "constant" γ_{dia} has *SI* units of sec^{-1}. In addition, there can be (*b*.) "spring-like" restoring forces $\vec{\tilde{F}}_{restore}(t) = -k_{dia}\vec{\tilde{x}}_{dia}(t)$ that are linearly proportional to the ***displacement*** of the diaphragm $\vec{\tilde{x}}_{dia}(t) = \tilde{x}_{dia}(t)\hat{n}$ along its axis $\hat{n}$, where $k_{dia}(N/m)$ is the spring constant associated with the restoring force. Thus, a somewhat more realistic situation associated with forces acting on the diaphragm of a microphone, Newton's 2nd law becomes:

$$\vec{\tilde{F}}_{tot}(t) = \vec{\tilde{F}}_{pressure}(t) + \vec{\tilde{F}}_{dissipate}(t) + \vec{\tilde{F}}_{restore}(t) = m_{dia}\vec{\tilde{a}}_{dia}(t)$$

We can rewrite this as: $$m_{dia}\vec{\tilde{a}}_{dia}(t) - \vec{\tilde{F}}_{dissipate}(t) - \vec{\tilde{F}}_{restore}(t) = \vec{\tilde{F}}_p(t)$$

Then: $$m_{dia}\vec{\tilde{a}}_{dia}(t) + m_{dia}\gamma_{dia}\vec{\tilde{v}}_{dia}(t) + k_{dia}\vec{\tilde{x}}_{dia}(t) = \tilde{p}(t)\vec{A}_{dia}$$