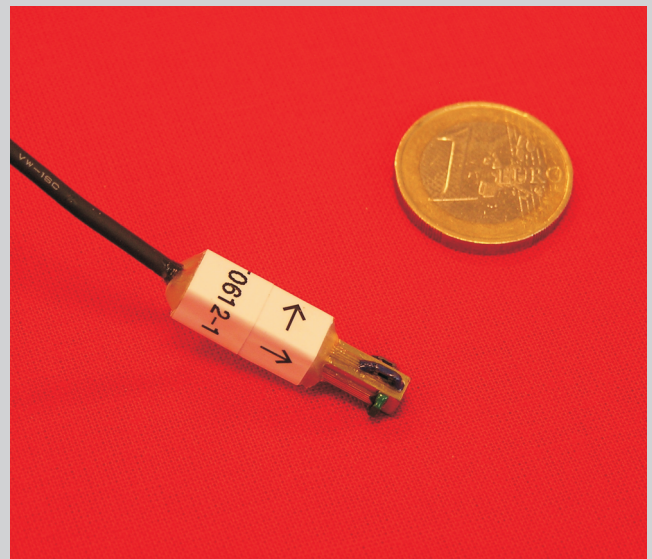


USP match

The three dimensional USP match probe consists of a three orthogonally placed Microflown acoustical particle velocity sensors and a miniature sound pressure transducer (Knowles FG series).

The USP match probe is mainly used as an AVS (Acoustic Vector Sensor). Acoustic vector sensors have come to play an increasingly significant role in this technology with application focus on border control, harbor protection, gunshot localization, and situation awareness.



Typical applications

- ✓ Sound intensity measurements
- ✓ Far field sound source localization
- ✓ Passive radar
- ✓ Measuring with a very high spatial resolution

Specification - USP match

Sensor configuration:

- 3x Microflown Titan sensor element
- 1x miniature pressure microphone

Physical characteristics:

Diameter : 9mm
Length : 32mm
Weight : 5g

Electrical properties:

Powering : power is supplied by the MFSC-4, 4channel signal conditioner. The input is provided by 7pins lemo cable

Environment

Max. temperature: 60 Degrees Celcius

Acoustical properties microphone element

Frequency range : 20Hz - 20kHz
Upper sound level : 110dB
Polar pattern : omnidirectional
Directivity : omnidirectional

Acoustical properties Microflown element

Frequency range : 0.1Hz - 20kHz \pm 1dB
Upper sound level : 135dB
Polar pattern : figure of eight
Directivity : directive

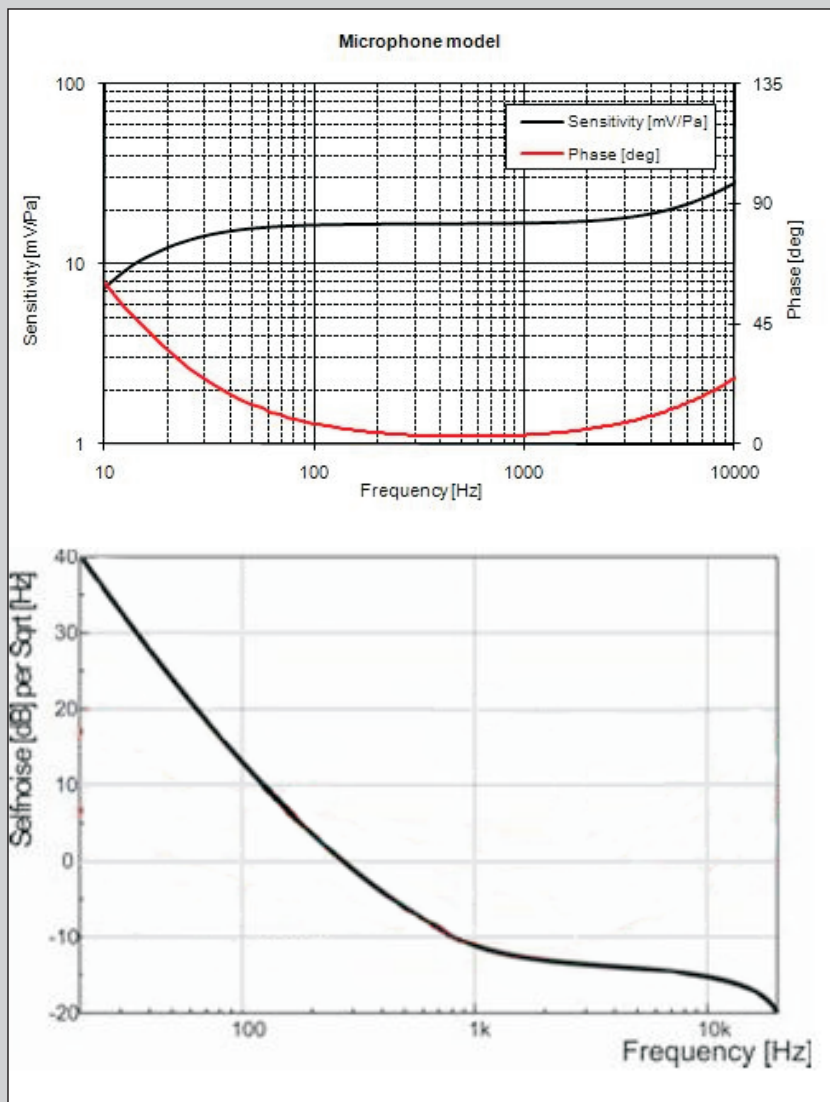
Model sound pressure microphone

The sensitivity of the pressure microphone (independent of high/low gain or corrected/uncorrectede mode):

$$S_p [mV/Pa] = S_p @1kHz \frac{\sqrt{1 + \frac{f^2}{f_{c3p}^2}}}{\sqrt{1 + \frac{f_{c1p}^2}{f^2}} \sqrt{1 + \frac{f_{c2p}^2}{f^2}}}$$

The phase of the pressure microphone (independent of high/low gain or corrected/uncorrectede mode):

$$\varphi_p [\text{deg}] = \arctan \frac{C_{1p}}{f} + \arctan \frac{C_{2p}}{f} + \arctan \frac{f}{C_{3p}}$$



Parameters pressure equations		
Sensitivity:		
$S_p @1kHz =$	55,0	[mV/Pa]
Sensitivity cornerfrequencies		
$fc1p =$	30	[Hz]
$fc2p =$	15	[Hz]
$fc3p =$	10000	[Hz]
Phase cornerfrequencies		
$C1p =$	30	[Hz]
$C2p =$	15	[Hz]
$C3p =$	10000	[Hz]

Model Microflow sensor

The sensitivity in uncorrected mode:

$$S_u [mV/Pa^*] = \frac{S_u @ 250Hz}{\sqrt{1 + \frac{f_{c1u}^2}{f^2}} \sqrt{1 + \frac{f^2}{f_{c2u}^2}} \sqrt{1 + \frac{f^2}{f_{c3u}^2}} \sqrt{1 + \frac{f_{c4u}^2}{f^2}} \sqrt{1 + \frac{f_{c5u}^2}{f^2}}}$$

The phase in uncorrected mode:

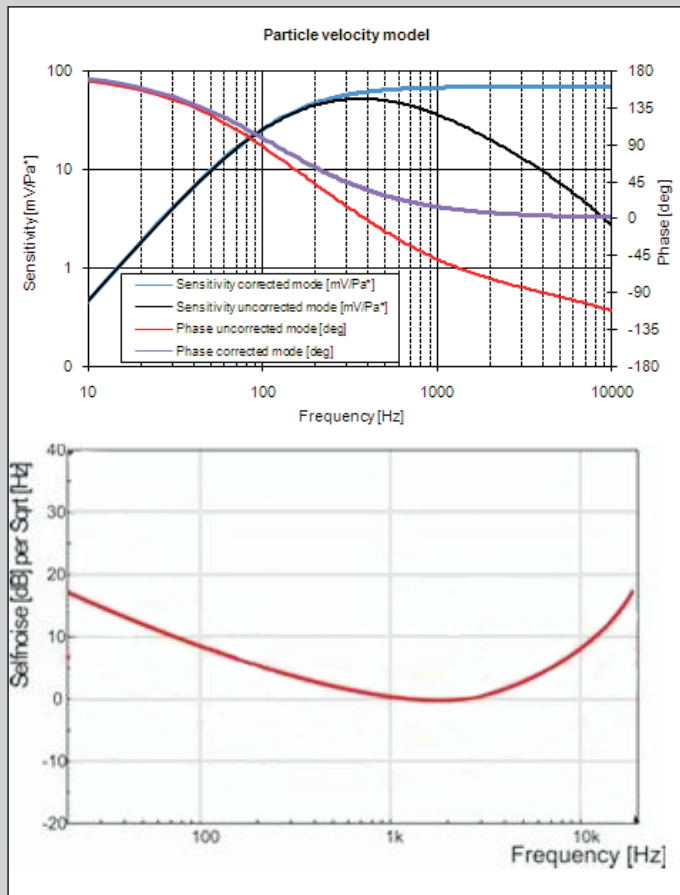
$$\varphi_u [\text{deg}] = \arctan \frac{C_{1u}}{f} - \arctan \frac{f}{C_{2u}} - \arctan \frac{f}{C_{3u}} - \arctan \frac{C_{4u}}{f} + \arctan \frac{C_{5u}}{f}$$

The sensitivity in corrected mode:

$$S_u [mV/Pa^*] = \frac{S_u @ 250Hz}{\sqrt{1 + \frac{f_{c1u}^2}{f^2}} \sqrt{1 + \frac{f_{c4u}^2}{f^2}} \sqrt{1 + \frac{f_{c5u}^2}{f^2}}}$$

The phase in corrected mode:

$$\varphi_u [\text{deg}] = \arctan \frac{C_{1u}}{f} + \arctan \frac{C_{4u}}{f} + \arctan \frac{C_{5u}}{f}$$



Parameters velocity equations		
<i>Sensitivity in high gain:</i>		
$S_u @ 250Hz =$	25	[mV/Pa*]
$S_u @ 250Hz =$	10	[V/(m/s)]
<i>Sensitivity in low gain:</i>		
$S_u @ 250Hz =$	0,25	[mV/Pa*]
$S_u @ 250Hz =$	0,1	[V/(m/s)]
<i>Sensitivity cornerfrequencies</i>		
$f_{c1u} =$	150	[Hz]
$f_{c2u} =$	600	[Hz]
$f_{c3u} =$	10000	[Hz]
$f_{c4u} =$	77	[Hz]
<i>Phase cornerfrequencies</i>		
$C_{1u} =$	180	[Hz]
$C_{2u} =$	700	[Hz]
$C_{3u} =$	20000	[Hz]
$C_{4u} =$	77	[Hz]