Microflown Technologies

Charting sound fields

Manual

PU-regular

MFPA-V1.0 2014 - 11

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A. The velocity sensor

The sensor is based in two tiny platinum wires, which are kept constantly heated to 200 degrees. The motion of the air surrounding them produce a temperature decrease in the first wire, the second wire is then less cooled down by the flow. This temperature difference is proportional to the wires resistance, providing a broad band (0 to at least 10 KHz) and linear signal proportional to the particle velocity.

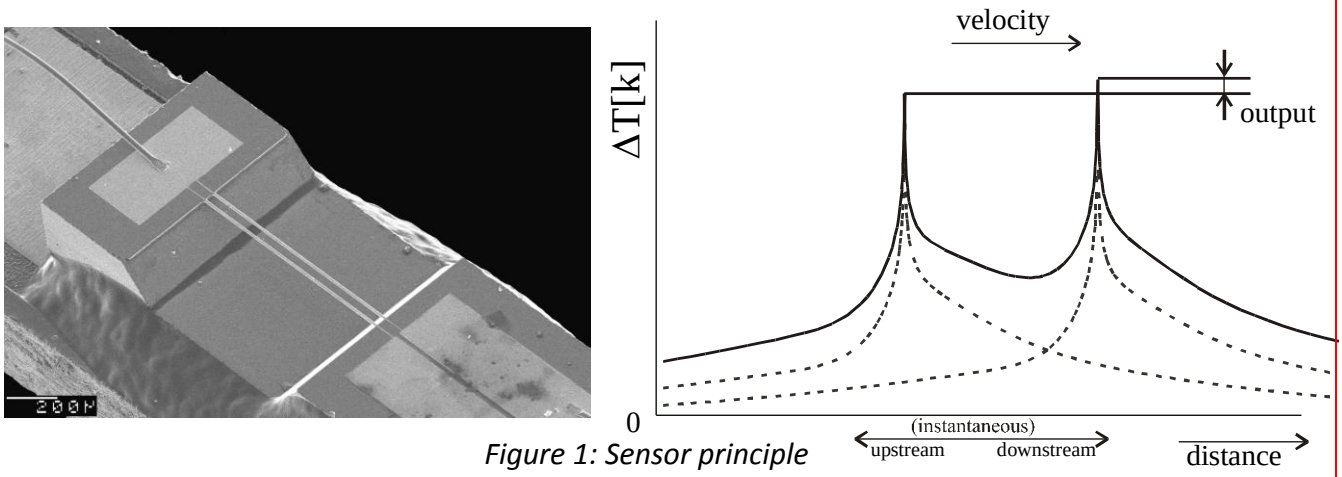

Figure 1: Sensor principle

B. The pressure sensor

The pressure microphone integrated in the probe is a FG-23329-D65. The combination of both sensors allows the direct measurement of sound intensity and acoustical impedance.

II. Probe characteristics

A. Characteristics table

Parameter	Value	Unit
Physical		
Connector	7 pin Lemo	
Diameter	1/2	inch
Length	90	mm
Weight	38	g
Velocity sensor material	Platinum	
Environmental parameters		
Operative temperature range	-17 to 63	°C
Sensitivity variation due to temperature	< 0.02	dB/K
Sensitivity variation due to Humidity (20-90%)	0.06	dB / %RH
Sensitivity variation due to pressure (1-0.82 bar)	< 0.5	dB
Measurement range Velocity sensor		
Maximum level range	125	dB PVL ref: 50 nm/s
Frequency response	0.1 - 10.000	Hz
Measurement uncertainty ±1 dB	60 - 8.000	Hz
Measurement uncertainty ±3 dB	20 - 10.000	Hz
Phase match within 5 ˚	60 - 8.000	Hz
Phase match within 20 ˚	20 - 10.000	Hz
Measurement range Pressure sensor		
Maximum level range	110	dB SPL ref: 20 e-5 Pa
Frequency response	20 - 10.000	Hz
Measurement uncertainty ±1 dB	60 - 7.000	Hz
Measurement uncertainty ±3 dB	20 - 10.000	Hz
Phase match within 5 ˚	60 - 7.000	Hz
Phase match within 15 ˚	20 - 10.000	Hz

B. Dynamic range

The dynamic range of the measurement chain formed by probe and signal conditioner MFPA-2 is described in the following graph:

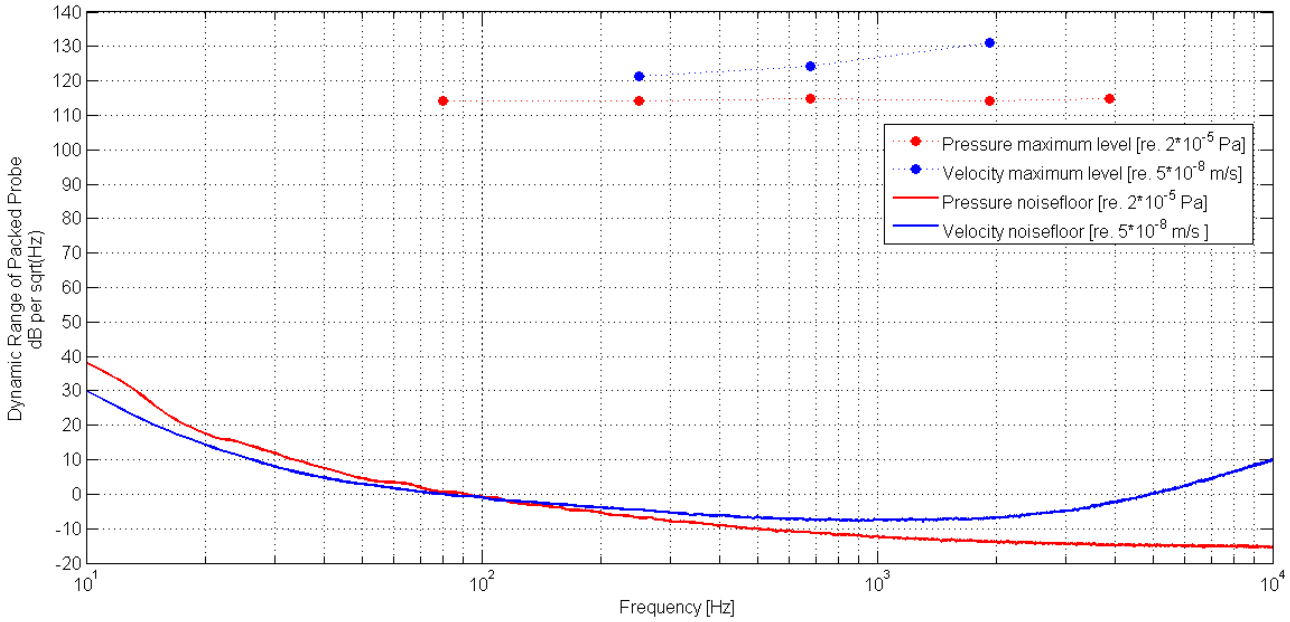

Figure 2. PR and MFPA-2 dynamic range

C. Response model

The response of both sensors, pressure and particle velocity, are modeled by a curve to which the response of the specific probe is fitted.

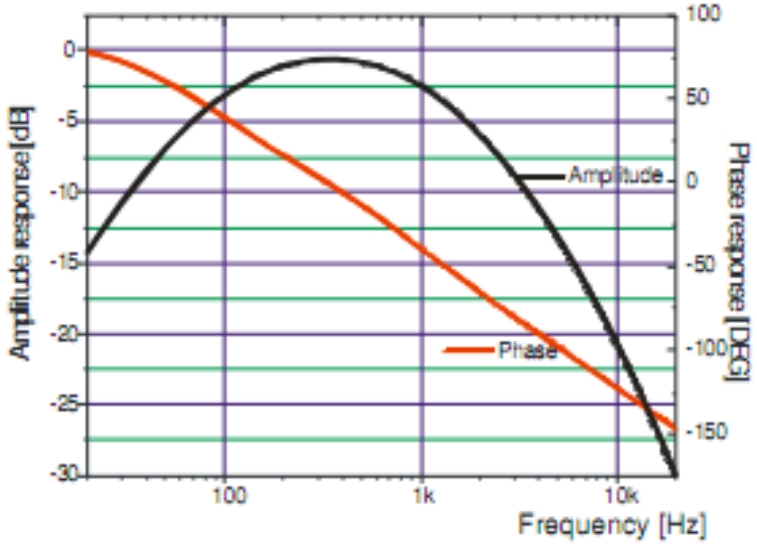

Figure 3. Velocity response model

To correct for the sensor non flat behavior, the model of the inverse response needs to be applied in order to obtain a flat response in the whole usable frequency range.

- Frequency response: Signal [Volts]/ Su or Sp
- Phase response: Signal [Volts]-ϕu or ϕp

a. Velocity sensor model:

$$Su\left[\frac{V}{m/s}\right] = \frac{S_u@250\ Hz\left[\frac{V}{m/s}\right]}{\sqrt{1+\frac{f_{c1u}^2}{f^2}}\sqrt{1+\frac{f^2}{f_{c2u}^2}}\sqrt{1+\frac{f^2}{f_{c3u}^2}}\sqrt{1+\frac{f_{c4u}^2}{f^2}}}$$

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

b. Pressure sensor model:

$$Sp\left[\frac{mV}{Pa}\right] = Sp@1KHz\frac{\sqrt{1+\frac{f^2}{f_{c3p}^2}}}{\sqrt{1+\frac{f_{c1p}^2}{f^2}}\sqrt{1+\frac{f_{c2p}^2}{f^2}}}$$

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

D. Directivity

a. Velocity sensor

The polar pattern has a figure of eight response.

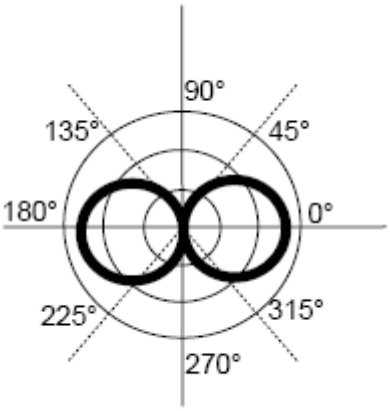

Figure 4: Particle velocity sensor polar pattern

b. Pressure sensor

The polar pattern has an omnidirectional response figure.

E. Package gain

The pressure and velocity sensors are mounted into a two-pillar structure which has the functionality of:

- Sensor protection
- Increasing the sensitivity of the velocity sensor

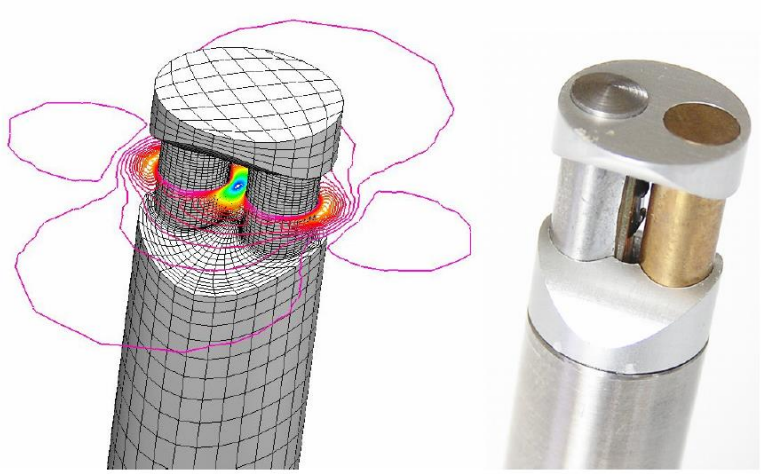

Figure 5: Package effect

This structure affects:

- The sensitivity: the sensitivity of the sensors with the two pillars increases 10 dBs.
- The spatial resolution of measurements is maximum the size of the sensor.
- The minimum distance to the object is also affected by the sensor head size.

F. DC-Flow

The PU regular probe can withstand up to 2 m/s wind speed before overload. Above this value special wind caps are made under request.

III. Recalibration

The PU mini requires calibration every 2 years

IV. Usage and precautions 

- Only use the 7 pin male to male Lemo cable supplied with your kit. Any modifications to this cable or use of cables of a different brand or type may result in permanent damage to the probe or the signal conditioner.
- Do not remove the probe metal mesh. This would affect the sensor response and could occur into sensor damage.
- PU regular sensor needs to be powered via signal conditioner. The new MFPA or the prior MFSC. Do not power the sensor by means of any other device, this might cause permanent damage to the system.

V. Technical Support

For any problem or doubt with your equipment, please contact Microflown Technologies Customer service:

- Mail: cs@microflown.com
- Skype: cs.microflown
- Telephone: +31(0) 88 001 08 11 Monday to Friday, from 9:00 to 17:00 (UTC+1).

VI. Warranty policy, repairs and replacements

A. Warranty and replacement or substitution

During the first two years (24 month) the seller offers a warranty on all its products, except for trading items and third party manufactured items. The seller warrants that all products will be free from defects in materials and workmanship for this period of two years. During this two years period, the seller will repair or replace products free of charge. Products damaged by accident, abuse, misuse, natural disaster or by any unauthorized disassembly, repair or modification are not covered by this warranty. The incurred transportation costs of returning the products to seller will be borne by the buyer. The logistical cost for returning the products back to the buyer will be borne by the seller. Several product come with a "VOID if seal is broken" sticker, the warranty is void at all time when this sticker is broken.

B. Grace period (year 3 and 4)

During the third and fourth year the seller offers a grace period. In the grace period the products purchased at an earlier date can be replaced by completely new state of the art products of the same scope of the original purchase. This applies only for the products known as standard probes and signal conditioners. In the first year of the grace period, (year 3) customers have an option to replace their products for 25 % of the actual ex works end-user price. The full freight and packaging charges apply.

In the second year of the grace period, (year4) customers have an option to replace their products for 50 % of the actual ex works end-user price. The full freight and packaging charges apply.

The new products are accompanied by a new warranty. Both the two years warranty and grace period become applicable again from the date of invoice.

C. Repairs outside warranty policy

Alternatively, two years after the purchase small repairs might be offered all time against estimated costs to be quoted. Repairs come with six months warranty under the same conditions as the two year warranty.

The warranty of the repairs lasts for 6 months.