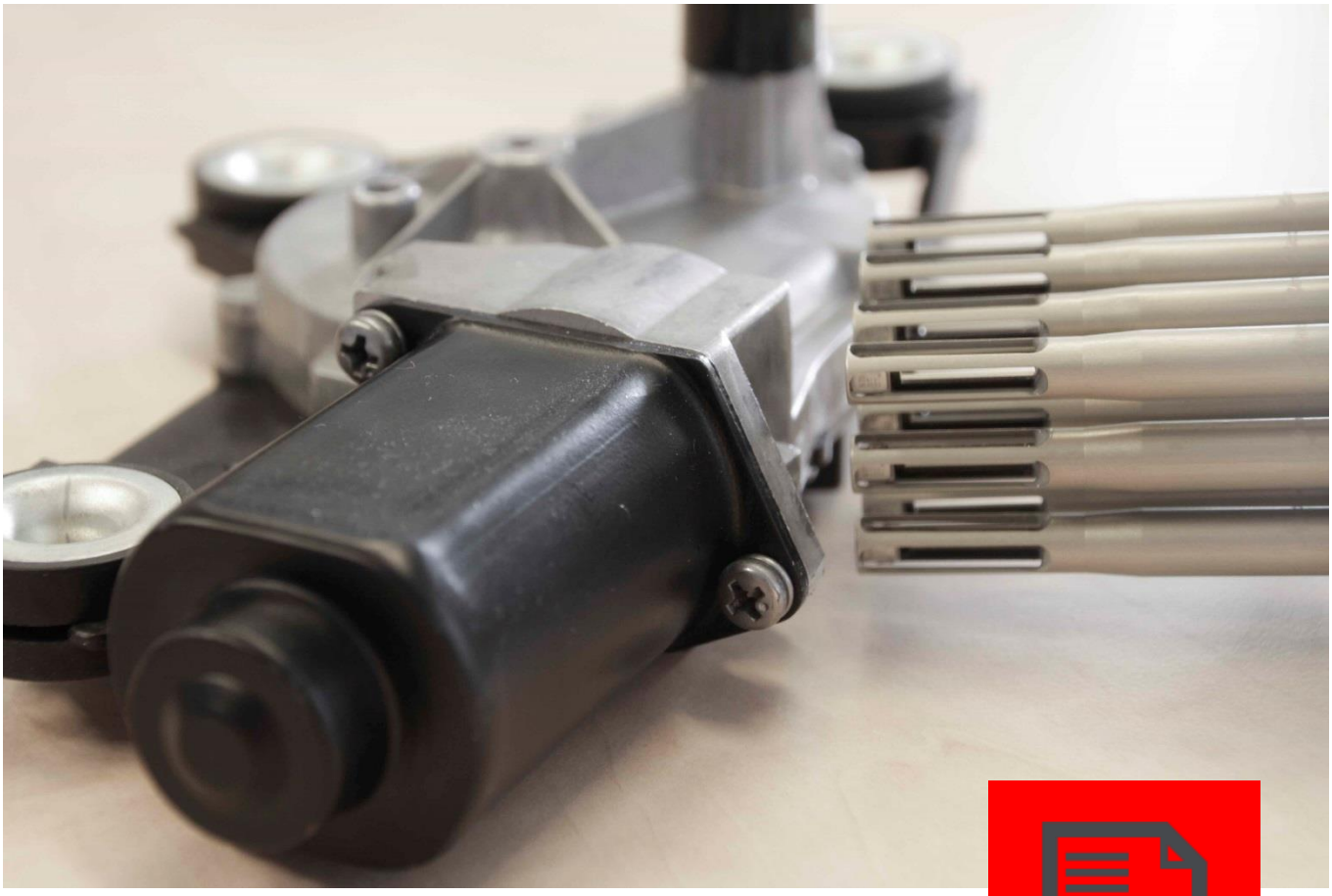
Microflown Technologies
Charting sound fields



Datasheet

Acoustic Camera

ARR-NN

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ACOUSTIC CAMERA

PU array and Velo software combined

Scalable system, compatible with PU mini and PU match sensors

Acoustic camera is a combination of Hardware (Microflown Technologies array) and software (Acoustic camera software, from VELO platform). It data acquisition from multiple PU sensors in parallel, overlaying the results on a static image / video recording, captured with the camera allocated behind the sensors.

Acoustic camera software includes two analyze methods, measurement of pressure, particle velocity and direct result plotting interpolating between measurement positions.

Near Field Holography which allows finer interpolation and measurement plane extension together with the estimation of the radiated noise at difference plane than measured.

AC software allows also the combination of the audio data with rotational information for order extraction and analysis. Making the system a very useful tool for NVH analysis.

I. ACOUSTIC CAMERA SOFTWARE METHODS

DIRECT MEASUREMENT

This method uses the directly measured Pressure and Particle velocity in the nearfield. The combination of multiple probes makes possible to measure non-stationary (time wise) conditions and locate transient noises like squeak, rattle or clicking noises. The method has no frequency limitations, being usable from 20 Hz to 10 KHZ.

The outcome of a measurement with the Acoustic Camera and its processing with this method is an acoustic picture, presented in a form of a movie, representing particle velocity, pressure, intensity, sound power and transfer functions between all channels; derived from the direct measurement of pressure and velocity by means of the PU probes.

ORDER EXTRACTION & ANALYSIS

The extraction of rotational information is possible by its direct measurement (by means of a tachometer) or extracting this information from the audio data, thanks to an innovative RPM extraction method which facilitates data gathering while the measurement is performed. The Velocity Synchoronous Discrete Fourier Transform (VDSFT) is used for transmiforming the data from the time domain to the order domain.

HOLOGRAPHY METHOD

The acquired data can be also processed using the Near Field Holography method, implemented in the acoustic camera software module. This method applies a model of the source propagation to estimate its response at a certain distance, different than the plane of measurement. This methodology allows the reconstruction of the noise radiation at a certain distance to the source, providing much higher spatial resolution using the same amount of transducers, more smoothed description of the noise field of interest and reducing the possible loss of information due to spatial aliasing.

II. COMPATIBLE PROBES

Probe type	Diameter (mm)	Maximum level range		Temperature range
		Pressure	Velocity	
PU mini	12.7 mm	110 dB	125 dB	-17 to 63
				
PU match	8.2 mm	131 dB	130 dB	-20 to 85
				
		*SPL ref: 20 e-5 Pa	*PVL ref: 50 nm/s	

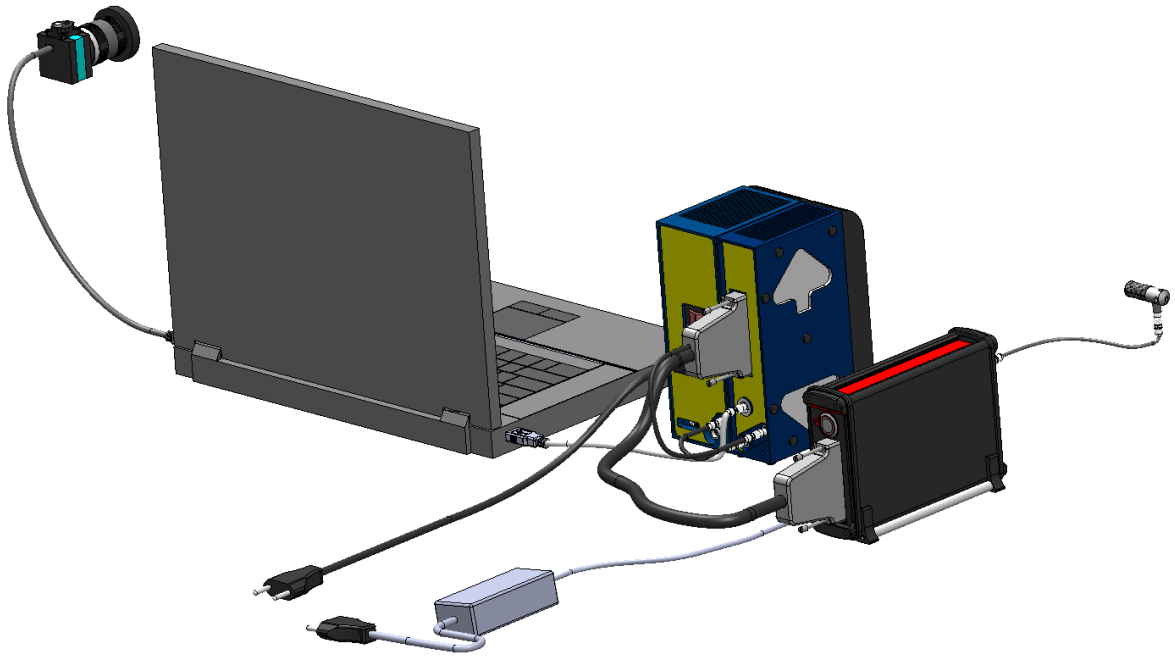
More specifications can be found on the probes datasheets.

III. COMPATIBLE FRONTENDS

Frontend	Nr. Channels		Max Fs (KHz)	Bits	IEPE
	Input	Output			
Scout422 	4 analog inputs 1 tachometer input 1 trigger input	1 amplified output 1 analog output	52	24	Yes
MFDAQ 	2analog input	1 analog output	48KHz	16 bits	No
DIC24 	24 input, expandable		350 Hz to 50 kHz	24 bits	yes

IV. CONFIGURATIONS & CONNECTIONS

Standard system configuration:



V. SYSTEM COMPONENTS

SENSORs	12x PU mini/match (PM/PTN)
CONDITIONER	1x MFPA-24 /MFSR-24
FRONTEND	1x Heim DIC24 1x PWAC power module
CAMERA	CCD- Imagine source
CABLES	
Probes-Conditioner	12x CAB-LEMO-1-44
DIC24-MFPA	1x 50 pun sub-D
DIC24-PC	1x USB cable (white)- Lemo
POWER SUPPLIES	
Scout	1x19V

VI. ACCESSORIES

Please consult our sales department (info@microflown.com) for suitable array fixtures for your measurement case. Typically we offer three approaches:

- HAND HELD ARRAY (ARR-GR-SP/ARR-GR-BIHEX/RECT1.8/RECT7.5): rigid grid frame with camera fixture. Operated by hand to perform point measuremenst as well as swiping an area while measuring, for sound source location. Different sizes and configurations available under request.

Figure 1. ARR-GR-1.8 option for hand held array grid

- IRREGULAR GRID (IRG-BT/GSN-PM2) : flexible structure to position the probes in a fixed location without touching the measured surface. Flexibility of the fixture allows bending it to be able to easily reach the measured area.

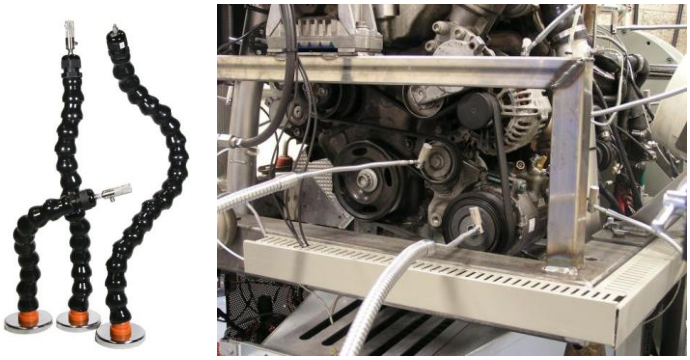


Figure 2. IRG-BT & GSN-PM2

- CUSTOMIZED MOUNTINGS: other mounting possibilities are possible under discussion.

VII. ANALYSIS METHODS CHARACTERISTICS

WHAT IS THE SPATIAL RESOLUTION OF THE ACOUSTIC CAMERA?

- Direct method: In the near field, it is the same as the spacing between the probes.
- NAH: it depends on the distance "array – measured object" and the characteristics of the source. In principle, with a specific distance, NAH should deliver around two times the spatial resolution obtained with the direct method.

IS THE RESOLUTION OF THE ACOUSTIC CAMERA FREQUENCY DEPENDENT?

- Direct method: No, the spatial resolution depends on the spacing between probes.
- NAH: no it only depends on the above mentioned parameters.

WHAT IS THE RECOMMENDED DISTANCE "OBJECT – ARRAY":

- Direct method: In most of the applications a distance of 5-10cm from the surface allows to have a good intensity measurement even in non-anechoic environments avoiding reactivity problems. The velocity has to be measured as close as possible to the surface to approximate the structural vibration and to get the best signal to noise ratio.
- NAH: recommended distance 1- 5 cm, depending on the probe spacing

WHAT IS THE FREQUENCY RANGE VALID TO MEASURE?

- Direct method: This depends on the distance from the surface. As a rule of thumb:
  - Particle velocity: 0.1- 10.000 Hz
  - Intensity: 400 -10.000 Hz
  - Pressure: 20 – 10.000 Hz
- NAH: depends on the probe spacing
  - PU match array (PTN): 50 – 10.000 Hz
  - PU mini array (PM), square configuration: 50-2.000 Hz

WHAT IS THE FREQUENCY RESOLUTION OF THE METHOD AND WHAT DOES IT DEPEND ON?

It can be dragged down to a few Hertz, depending on the FFT analyzer settings

HOW DO THE RECONSTRUCTION POINTS AFFECT MY RESULT WITH NAH?

They change the smoothness of the color maps but the spatial resolution (ability to detect two noise sources) stays unchanged.

WHAT IS THE DYNAMIC RANGE OF THE ACOUSTIC CAMERA?

The dynamic range of the Acoustic Camera system depends only on the limitation of the sensors employed in a measurement. Please check your sensors data sheet for more information.

CAN THE SIGNALS BE REVIEWED AND ANALYZED IN REAL TIME?

Acoustic Camera software has a very complete real time viewer tool to obtain an overview of what is being recorded

CAN THE RECORDED SIGNALS BE REPLAYED?

Yes, all time signals can be replayed either alone or in conjunction with the recorded video. Audio and video synchronization is conducted automatically.

VIII. USAGE AND PRECAUTIONS

- Do not submerge the electronics in water as this will lead to permanent damage.
- Only use the cables supplied with the kit. Any modifications to these cables or the use of cables of a different brand or type may result in permanent damage to the probes or the rest of the electronics.
- The probes must be powered via a Microflown™ signal conditioner, the new MFPA series or the prior MFSC/ Router. Do not power the sensors with any other device; this might cause permanent damage to the system.
- Access exposure to dust/dirt particles could damage the Microflown™ sensor.

IX. 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).

X. WARRANTY POLICY, REPAIRS AND REPLACEMENTS

WARRANTY AND REPLACEMENT OR SUBSTITUTION

During the first two years (24 months) 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 year period, the seller will repair or replace defect 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 products come with a "VOID if seal is broken" sticker, the warranty is void at all times when this sticker is broken.

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.

REPAIRS OUTSIDE WARRANTY POLICY

Replaced/repaired parts come with a six month warranty under the same conditions as the two year warranty.