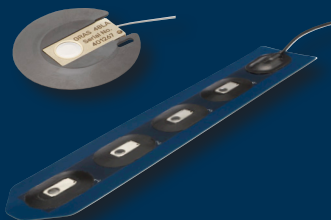


Measurement Microphones for Aeroacoustics

AEROACOUSTIC TOOLBOX

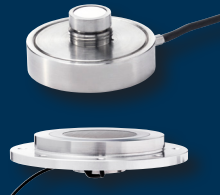
Ultra-Thin Precision Microphones



Surface Microphones



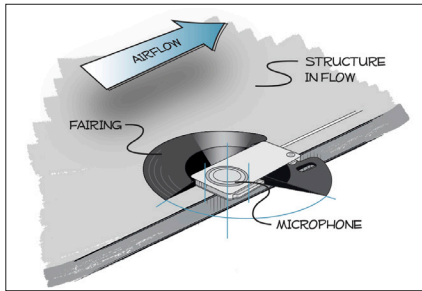
Flush-mount Microphones



Microphones and Accessories



UTP Microphones – Ultra-Thin Precision Microphones



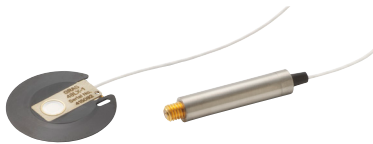
The GRAS UTP microphones provide the ability to quantify and understand boundary layer and turbulence noise. They combine the advantages of precision measurement microphone with a small form factor. All LX versions have TEDS. The height of the single sensors is 1 mm, the line arrays are 1.35 mm.

- > High-precision measurement microphones with integrated preamplifier
- > Ideal for low-boundary layer testing and confined spaces
- > Fast mounting and remounting with good repeatability/consistent geometry
- > Easy in-situ verification
- > Wide linear frequency range and dynamic range



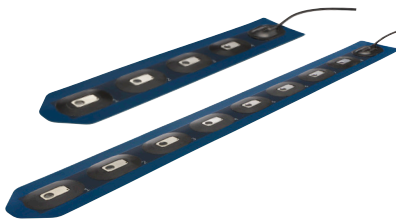
1/4" UTP, High Pressure GRAS 48LA

Frequency range	20 Hz - 20 kHz (± 1 dB) 15 to 31.5 kHz (± 3 dB)
Dynamic range	64 dB(A) - 184 dB
Sensitivity	0.12 mV/Pa
Venting	Front
Height	1 mm



1/4" UTP, Medium Pressure GRAS 48LX-1

Frequency range	20 Hz - 40 kHz (± 1 dB) 10 Hz to 70 kHz (± 3 dB)
Dynamic range	54 dB(A) - 170 dB
Sensitivity	0.6 mV/Pa
Venting	Front
Height	1 mm

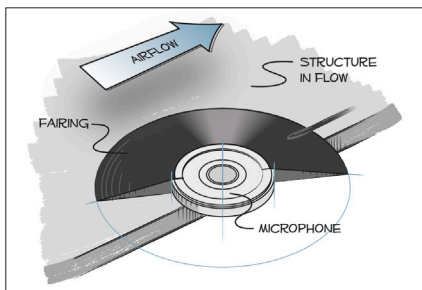


1/4" UTP Line Arrays, Medium Pressure

GRAS 48LX-4
GRAS 48LX-8

Frequency range	20 Hz - 20 kHz (± 1 dB) 10 Hz to 70 kHz (± 3 dB)
Dynamic range	54 dB(A) - 170 dB
Sensitivity	0.6 mV/Pa
Venting	Front
Height	1.35 mm

Surface Microphones



The GRAS high-precision surface microphones are designed for in-situ boundary layer testing, where non-invasive mounting is a must. They are, therefore, also well suited for in-flow testing of full-scale objects in wind tunnels. The height has been kept at 2.5 mm and a fairing reduces self-generated turbulence.

- > High-precision measurement microphones
- > Non-invasive mounting and insignificant protrusion
- > Integrated preamplifier with plug and measure functionality (TEDS)
- > Wide linear frequency range
- > Wide dynamic range



1/4" Surface GRAS 40LA/40LS

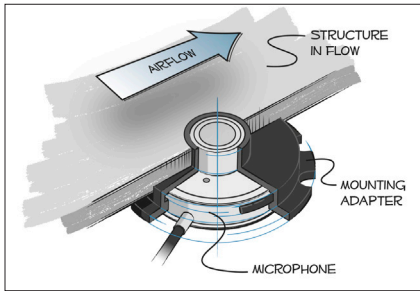
Frequency range	10 Hz - 20 kHz (± 1 dB) 5 Hz - 70 kHz (± 3 dB)
Dynamic range	56 dB(A) - 178 dB (40LA) 46 dB(A) - 167 dB (40LS)
Sensitivity	0.5 mV/Pa / 1.8 mV/Pa
Venting	Front
Height	2.5 mm



Surface GRAS 40PS-1

Frequency range	10 Hz - 12 kHz (+1, -2 dB) 10 Hz - 20 kHz (+1, -6 dB)
Dynamic range	27 dB(A) - 145 dB
Sensitivity	15 mV/Pa
Venting	Front
Height	2.5 mm

Flush-mount Microphones



This line of acoustic sensors combines the high precision and reliability of GRAS measurement microphones with the need for fitting sensors into confined spaces and narrow structures. With an installation height of less than 10 mm, they can be integrated into virtually any design without sacrificing aerodynamic properties.

- > High-precision measurement microphones
- > Very low installation height
- > Integrated preamplifier with plug and measure functionality (TEDS)
- > Wide linear frequency range and dynamic range



1/2" Flush-mount
GRAS 47AX

Frequency range	5 Hz - 12.5 kHz (± 1 dB) 3.15 Hz - 20 kHz (± 2 dB)
Dynamic range	22 dB(A) - 150 dB
Sensitivity	12.5 mV/Pa
Venting	Front



1/4" Flush-mount
GRAS 47BX

Frequency range	10 Hz - 25 kHz (± 1 dB) 4 Hz - 70 kHz (± 2 dB)
Dynamic range	44 dB(A) - 166 dB
Sensitivity	1.6 mV/Pa
Venting	Front



1/8" Flush-mount
GRAS 47DX

Frequency range	10 Hz - 100 kHz (± 3 dB)
Dynamic range	52 dB(A) - 174 dB
Sensitivity	0.9 mV/Pa
Venting	Front



**Flush-mount
Turbulence
Screen Kit**
GRAS 67TS-1-CL

Turbulence attenuation	Up to 25 dB*
Turbulence speed	Up to Mach 0.2
Frequency range (turbulence)	500 Hz - 10 kHz*
Acoustic attenuation	Less than 3 dB*
Approach	± 60 Deg
Frequency range (acoustic)	100 Hz - 70 kHz (± 2 dB)
Dynamic range	44 dB(A) - 166 dB
Venting	Front

*Depending on flow-speed

Microphones

Below a subset of our standard microphone sets are listed. They are front vented. Nose cones are listed on the next page. Adapters for flush mounting in windtunnels are available upon request. Contact GRAS for more information.



1/2" Pressure
GRAS 46AO-FV

Frequency range	5 Hz - 12.5 kHz (± 1 dB) 3.15 Hz - 20 kHz (± 2 dB)
Dynamic range	25 dB(A) - 150 dB
Sensitivity	12 mV/Pa
Venting	Front



1/4" Pressure
GRAS 46BD-FV

Frequency range	10 Hz - 25 kHz (± 1 dB) 4 Hz - 70 kHz (± 2 dB)
Dynamic range	44 dB(A) - 166 dB
Sensitivity	1.45 mV/Pa
Venting	Front



1/8" Pressure
GRAS 46BG-FV

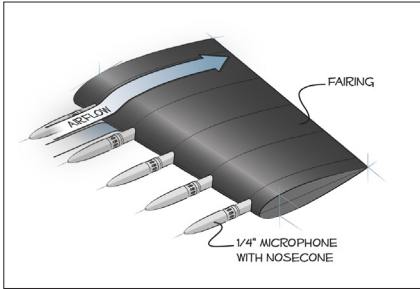
Frequency range	10 Hz - 25 kHz (± 1 dB) 3.15 Hz - 70 kHz (± 2 dB)
Dynamic range	60 dB(A) - 184 dB
Sensitivity	0.25 mV/Pa
Venting	Front



1/16" Pressure
GRAS 46DE-FV

Frequency range	10 Hz - 25 kHz (± 1 dB) 6.5 Hz - 140 kHz (± 3 dB)
Dynamic range	52 dB(A) - 174 dB
Sensitivity	0.8 mV/Pa
Venting	Front

Nose Cones



The GRAS nose cones have a better in-flow noise rejection compared to other designs. The blunt tip design is ideal at relatively low wind speeds and in places where it is of interest to make near-field measurements in the flow.

- > High induced flow-noise reduction
- > Low acoustic attenuation
- > Lightweight design to reduce vibrations and wake noise
- > Single or array mounting
- > Standard microphone accommodation



RA0020 for 1/2" standard microphone sets

RA0022 for 1/4" standard microphone sets

RA0173 for 1/8" standard microphone sets

Accessories

ACCESSORIES FOR UTP MICROPHONES

MOUNTING	
RA4810	Hard Fairing for 48LA/48LX-1 with Click Mount, 1 pc.
RA4810-10	Hard Fairing for 48LA/48LX-1 with Click Mount, 50 pcs.
RA4810-2	Hard Fairing for 48LA/48LX-1 with Click Mount, 10 pcs.
DB0475	Self-adhesive Mounting Pad for Hard Fairing
RA4811	Soft Fairing and Mounting Kit for UTP Microphone Sets

VERIFICATION AND CALIBRATION	
RA4800	Adapter for Sensitivity Verification of Flush/Surface Mics.
RA4801	Adapter for Sensitivity Calibration of 48LA/48LX-1
RA4802	Actuator for Frequency Calibration of 48LA/48LX-1
RA4803	Sensitivity and Frequency Calibration Kit for 48LX-4/48LX-8
RA4804	Pistonphone Adaptor for 48LX-4/48LX-8
RA4805	Actuator and Pistonphone Adapter for 48LA/48LX-1
RA4806	Actuator and Pistonphone Adapter for 48LX-4/48LX-8

ACCESSORIES FOR FLUSH-MOUNT MICROPHONES

ACCESSORIES	
RA0501	Mounting Adapter for 1/2" Flush-mount Microphone Set
RA0502	Mounting Adapter for 1/4" Flush-mount Microphone Set
RA0503	Mounting Adapter for 1/8" Flush-mount Microphone Set
67TS	Turbulence Screen Kit (without microphone)

FAIRING FOR 40LA/LS

FAIRING	
GR1297	Fairing for 40LA/LS, Aluminum

CUSTOMIZATION

Various options for customization are available, for example pinhole mounting and mounting with protective wire mesh.

Contact GRAS for more information.

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