

# Measurement Microphones for Aeroacoustics

## AEROACOUSTIC TOOLBOX

### Ultra-Thin Precision Microphones



### Surface Microphones



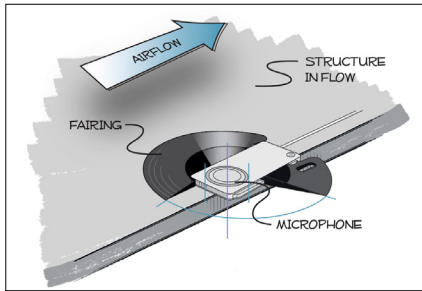
### Flush-mount Microphones



### Microphones and Accessories

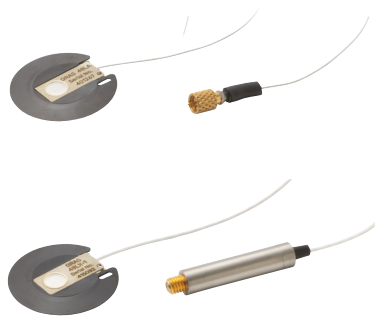


## UTP Microphones – Ultra-Thin Precision Microphones



The GRAS UTP microphones provide the ability to quantify and understand boundary layer and turbulence noise. They beat any flush- or surface-mounted microphone on the market – superior performance, unbeatable price, fast and repeatable mounting – and should be a first choice for cost-effective, high-precision testing.

- > 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

<b>Frequency range</b>	20 Hz - 20 kHz ( $\pm 1$ dB) 15 to 31.5 kHz ( $\pm 3$ dB)
<b>Dynamic range</b>	64 dB(A) - 184 dB
<b>Sensitivity</b>	0.12 mV/Pa
<b>Venting</b>	Front
<b>Height</b>	1 mm

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

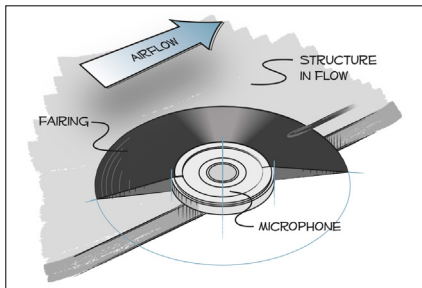
<b>Frequency range</b>	20 Hz - 40 kHz ( $\pm 1$ dB) 10 Hz to 70 kHz ( $\pm 3$ dB)
<b>Dynamic range</b>	54 dB(A) - 170 dB
<b>Sensitivity</b>	0.6 mV/Pa
<b>Venting</b>	Front
<b>Height</b>	1 mm

### Dimensions (mm)

Total height is 1 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



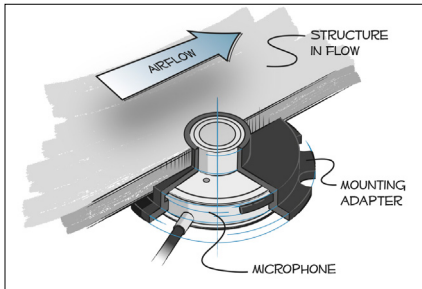
### 1/4" Surface GRAS 40LA/40LS

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

### Surface GRAS 40PS-1

<b>Frequency range</b>	10 Hz - 12 kHz (+1, -2 dB) 10 Hz - 20 kHz (+1, -6 dB)
<b>Dynamic range</b>	27 dB(A) - 145 dB
<b>Sensitivity</b>	15 mV/Pa
<b>Venting</b>	Front
<b>Height</b>	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 ( $\pm 1$  dB)

**Dynamic range**

3.15 Hz - 20 kHz ( $\pm 2$  dB)

**Sensitivity**

22 dB(A) - 150 dB

**Venting**

12.5 mV/Pa

Front



**1/4" Flush-mount**  
GRAS 47BX

**Frequency range**

10 Hz - 25 kHz ( $\pm 1$  dB)

**Dynamic range**

4 Hz - 70 kHz ( $\pm 2$  dB)

**Sensitivity**

44 dB(A) - 166 dB

**Venting**

1.6 mV/Pa

Front



**1/8" Flush-mount**  
GRAS 47DX

**Frequency range**

10 Hz - 100 kHz ( $\pm 3$  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**

$\pm 60$  Deg

**Frequency range (acoustic)**

100 Hz - 70 kHz ( $\pm 2$  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 and windscreens are available upon request. Contact GRAS for more information.



**1/2" Pressure**  
GRAS 46AO-FV

**Frequency range**

5 Hz - 12.5 kHz ( $\pm 1$  dB)

**Dynamic range**

3.15 Hz - 20 kHz ( $\pm 2$  dB)

**Sensitivity**

25 dB(A) - 150 dB

**Venting**

12 mV/Pa

Front



**1/4" Pressure**  
GRAS 46BD-FV

**Frequency range**

10 Hz - 25 kHz ( $\pm 1$  dB)

**Dynamic range**

4 Hz - 70 kHz ( $\pm 2$  dB)

**Sensitivity**

44 dB(A) - 166 dB

**Venting**

1.45 mV/Pa

Front



**1/4" Pressure**  
GRAS 46BG-FV

**Frequency range**

10 Hz - 25 kHz ( $\pm 1$  dB)

**Dynamic range**

3.15 Hz - 70 kHz ( $\pm 2$  dB)

**Sensitivity**

60 dB(A) - 184 dB

**Venting**

0.25 mV/Pa

Front



**1/8" Pressure**  
GRAS 46DE-FV

**Frequency range**

10 Hz - 25 kHz ( $\pm 1$  dB)

**Dynamic range**

6.5 Hz - 140 kHz ( $\pm 3$  dB)

**Sensitivity**

52 dB(A) - 174 dB

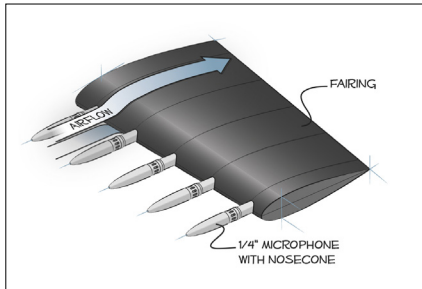
**Venting**

0.8 mV/Pa

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
RA4805	Actuator and Pistonphone Adapter for 48LA/48LX-1

### 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
RA0302	Removal Tool for 1/2" & 1/4" Flush-mount Microphones
67TS	Turbulence Screen Kit (without microphone)

### FAIRING FOR 40LA/LS

#### FAIRING

GR1297	Fairing for 40LA/LS, Aluminum
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### 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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### About GRAS Sound & Vibration

GRAS is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones to industries where acoustic measuring accuracy and repeatability is of utmost importance in R&D, QA and production. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, and consumer electronics. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.

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