G.R.A.S.
SOUND & VIBRATION

Instruction Manual

½" Low-noise Microphone System Type 40HL

LI0107 - Revision 7 September 2012

Contents

Introduction

The G.R.A.S. ½" Low-noise Microphone System Type 40HL (Fig. 1) measures sound pressure levels well below the threshold of human hearing. It is thus generally suitable for sound-power measurements on even very quiet products. Its very wide dynamic range permits measurements down to below –2 dB re. 20 µPa (in ⅓-octave bands) from 20 Hz to 20 kHz.
Type 40HL comprises:

- a special high-sensitive ½" condenser free-field microphone
- a dedicated ½" low-noise preamplifier.

IMORTANT!
The preamplifier and microphone are an individually matched combination that is assembled and sealed under clean-room conditions.. For it to retain optimal performance, do not separate the microphone from the preamplifer .

Type 40HL connects to most standard power modules with LEMO 1B connector (optional accessories from G.R.A.S. - refer to the section *What to Order*):

The power modules supply voltages for powering preamplifiers and polarizing microphones.

Fig 1.1 ½" Low-noise Measurement Microphone System Type 40HL

Preamplifier

The preamplifier is a true ½" low-noise amplifier with LEMO 1B connector and has a built-in compensation filter for free-field microphones.

Microphone

The microphone is a ½" low-noise externally-polarized free-field microphone with a specially reduced inherent noise floor in order to achieve a high dynamic range and wide frequency range. Its diaphragm is specially tuned to yield high sensitivity coupled with low internal-noise generation.

Frequency Response and Noise Floor

A typical free-field response of Type 40HL for 0° is shown in Fig. 1.2.
Fig. 1.3 shows free-field corrections for various angles of incidence on the ½" microphone.

Operating Type 40HL

For holding the microphone, you can order Tripod AL0006 and Tripod Adapter RA0093
For level calibration of Type 40HL you need:

- either Pistonphone Type 40AP (recommended due to its built-in precision barometer) or Pistonphone Type 40AA

and

- Calibration Adapter RA0090 for attenuating the pistonphone signal to 94 dB re. 20 µPa.

See also the section *What to Order.*

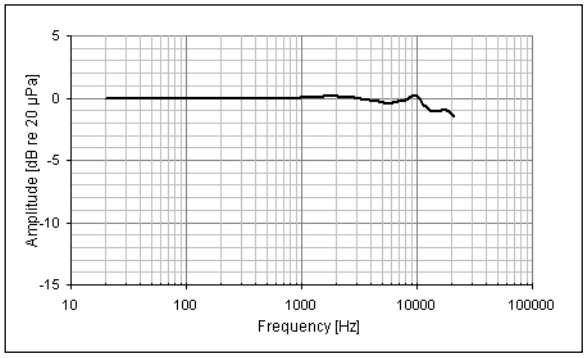

Fig 1.2 Typical frequency response curves of Type 40HL

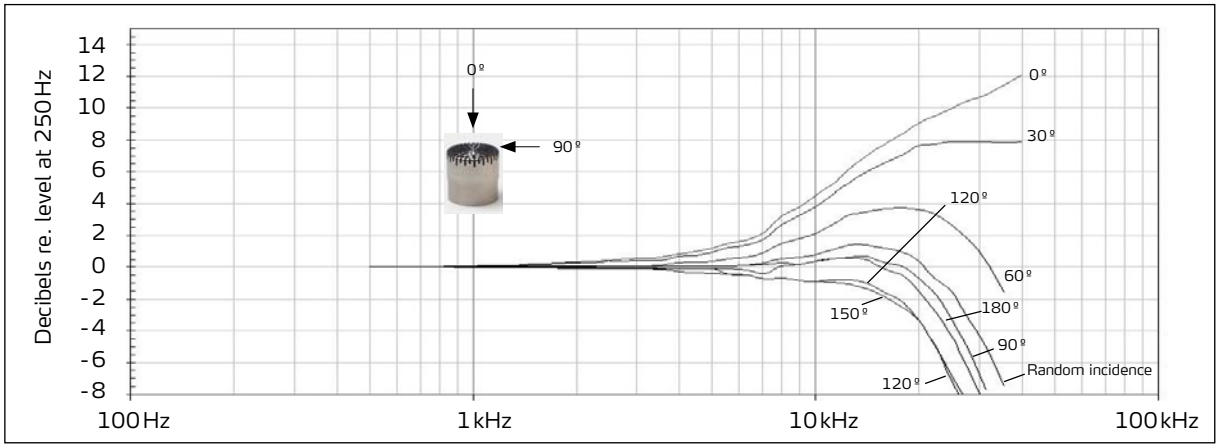

Fig 1.3 Free-field corrections for various angles of incidence on the ½" microphone

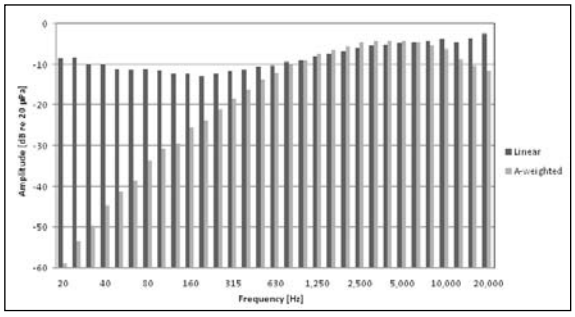

Fig 1.4 Typical noise floor of Type 40HL for system and microphone. Shown in ⅓-octave bands for both the linear and A-weighted cases.

Calibration
Based on System Sensitivity

Since the microphone signal is amplified by 20 dB in the preamplifier, the nominal system sensitivity at the output of the preamplifier corresponds to 0.85 V/Pa. In other words, when the measured output voltage from the preamplifier is 0.85 V RMS, the microphone is being subjected to 94 dB re. 20 µPa.

The actual system sensitivity is given on the individual calibration chart supplied with each Low-noise Microphone System Type 40HL.

Based on this information, proceed as follows:
1. Connect the Type 40HL via its LEMO plug to the LEMO input socket of the analyzer.
2. Connect via a suitable cable the BNC output of the power module to the analyzer to be used, and switch both power module and analyzer on.
3. Adjust the analyzer to indicate 94 dB re. 20 µPa for an RMS input of S volts; where S is the system sensitivity of the Type 40HL as quoted on the calibration chart.

Pistonphone Calibration
Use either Pistonphone Type 42AP, with built-in precision barometer (recommended), or Pistonphone Type 42AA, fitted with a Coupler RA0090 (all items available from G.R.A.S.) to produce 94 dB re. 20 µPa on the microphone of Type 40HL.

> IMPORTANT!
> A pistonphone fitted with a normal ½" coupler cannot be used because this will overload the system with a level of 114 dB re. 20 µPa.

Proceed as follows:
1. Connect the Type 40HL via its LEMO plug to the LEMO input socket of the power module.
2. Connect via a suitable cable the BNC output of the power module to the analyzer to be used, and switch both Power Module and analyzer on.
3. Unscrew and remove the normal coupler of the pistonphone.
4. Screw Coupler RA0090 to the pistonphone, see Fig. 2.1.
5. Push-fit ½" Adapter RA0181 shown Fig. 2.1 to the entrance of Coupler RA0090.

Fig 2.1 ***Pistonphone without its normal coupler and ready to accept the Coupler RA0090***

Fig 2.2 Pistonphone fitted with Coupler RA0090 and the microphone inserted into the coupler. The spring arrangement supplied with the coupler is not used.

6. Mount the microphone of the Type 40HL in the Coupler as shown in Fig. 2.2, and switch the Pistonphone on.
7. Adjust the analyzer to indicate 94 dB* re. 20 µPa.

Frequency Response Calibration

The frequency response of the microphone has been factory-calibrated in a free field (anechoic chamber) by comparison with a reference microphone.

** Plus any corrections for barometric pressure. See pistonphone manual.*

Operating Type 40HL

1. Mount Type 40HL onto a stand (e.g. Tripod AL0006 with Tripod Adapter RA0093)

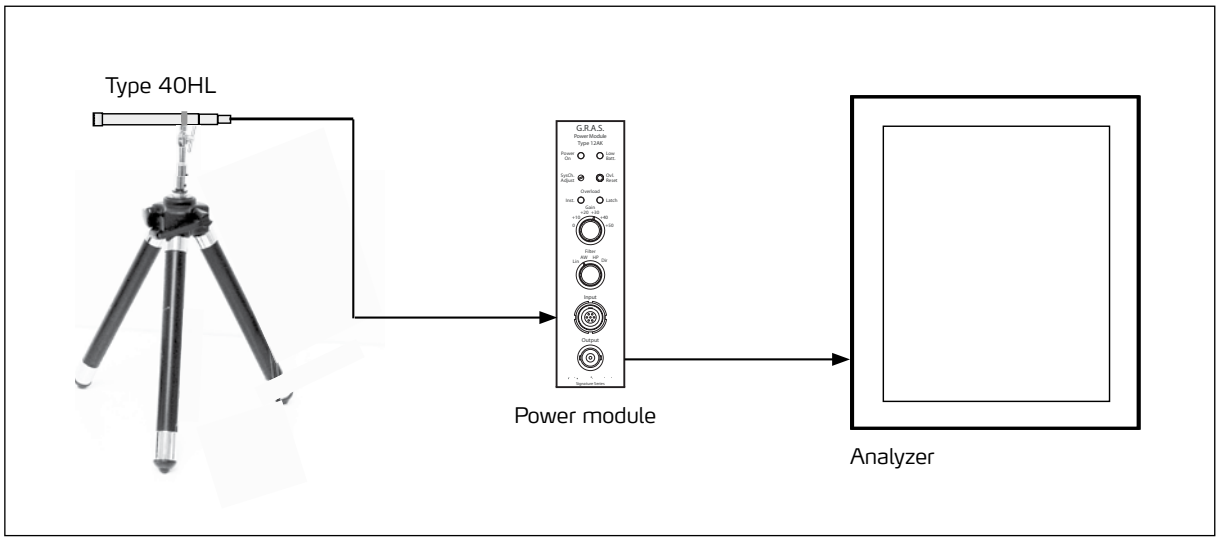

Fig 3.1 Setup for measurements: Type 40HL mounted on Tripod AL0006 viaTripod Adapter RA0093

Specifications

Low-noise Microphone System Type 40 HL comprising:
½ Microphone, free-field, ext.-polarized
½ Preamplifier (with LEMO 1B plug)

Frequency response:

12.5 Hz - 10 kHz:	±1.0 dB
10 Hz - 16 kHz:	±2.0 dB
6 Hz - 20 kHz:	+2.0 dB, –3.0 dB

Nominal sensitivity, system:
850 mV/Pa ±2 dB

Microphone polarization voltage:
200 V

Power supply:
+/– 15 V to +/– 60 V or 30 to120 V

Power consumption:
max 5 mA

Dynamic range:

Upper limit:	113 dB re. 20 µPa
Lower limit (inherent noise):	6.5 dBA re. 20 µPa

Temperature range:
–20 °C to +60 °C

Accessories

Power Module (2-ch., batt.-op.):	Type 12AA
Power Module (1-ch., batt-op.):	Type 12AD
Power Module (1-ch.):	Type 12AK
Power Module (2-ch.):	Type 12AQ
Windscreens (set of 5)	AM0069
Pistonphone, built-in precision barometer (250 Hz or 251.2 Hz, 114 dB +/– 0,05 dB): (recommended)	Type 42AP
Pistonphone (250 Hz, 114 dB +/– 0,08 dB):	Type 42AA
Pistonphone Coupler (94 dB re. 20 µPa): (required for both pistonphones)	RA0090
Tripod:	AL0006
Tripod Adapter (required):	RA0093
3-m Extension cable*:	AA0008
10-m Extension cable*:	AA0009
30-m Extension cable*:	AA0012

* *These cables also function as connection cables (to connect directly from Type 40HL to a power module).*

Manufactured to conform with:

CE marking directive: 93/68/EEC

WEEE directive: 2002/96/EC

RoHS directive: 2002/95/EC

G.R.A.S. Sound & Vibration continually strives to improve the quality of our products for our customers; therefore, the specifications and accessories are subject to change.