

Instruction Manual

Single-channel Low-noise Measuring System consisting of:
1-inch Low-noise Level Microphone System Type 40HF and
Power Module Type 12HF



G.R.A.S.
Sound & Vibration

**Single-channel
Low-noise Measuring System
consisting of:
1-inch Low-noise Level Microphone System Type 40HF
Power Module Type 12HF**

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1. Introduction and Description

Fig. 1.1 shows a 1-inch Low-noise Level Microphone System Type 40HF which comprises:

- 1-inch Microphone Type 40EH.
- 1-inch Preamplifier Type 26HF with two built-in compensation filters and an overload-warning LED.

To complete the system, a special single or 10-channel power module is required and is available from G.R.A.S., i.e.

- Type 12HF for single-channel measurements, see Fig. 1.2 (left).

Or

- Type 12HM for multi-channel (1 to 10) measurements, see Fig. 1.2 (right)

The chosen power module provides all necessary voltages for powering the preamplifier(s) as well as polarising the microphone(s).

Fig. 1.3 shows a Single-channel Low-noise Measuring system (as described in this document) and consists of:

- 1-inch Low-noise Level Microphone System Type 40HF.
- Power Module Type 12HF.

Note: the power module must be ordered separately and the tripod and tripod adapter are optional extras.



Fig. 1.1 1-inch Low-noise Measurement Microphone System Type 40HF

1.1 Microphone Type 40EH

The Type 40EH is a special high-sensitive 1-inch pressure microphone with a nominal sensitivity of 110 mV/Pa. It is externally polarised with a specially reduced inherent noise floor in order to achieve a high dynamic range and wide frequency range.

1.2 Preamplifier Type 26HF

The body of the preamplifier has an overload-warning LED, (Fig. 1.1), which is repeated on the front panel of the chosen power module (Fig. 2.1).

The signal of the microphone is amplified by 20 dB in the Preamplifier Type 26HF.

The two compensation filters give the system two parallel outputs which correspond to:

- linear pressure-frequency response.
- linear free-field frequency response at an angle of 0° incidence.

The choice of which frequency response to use is made via a two-position switch marked **Pressure / Free Field**: on the front panel of the power module (see Fig. 2.1).

Fig. 1.4 shows the responses of the two compensation filters as well as the free-field response for 0° incidence. Note: free-field corrections are added to the lowest curve.

Fig. 1.5 shows the what these free-field corrections are for various angles of incidence.

Fig. 1.6 shows, for a complete low-noise measuring system, a typical noise floor in 1/3-octave bands for both the linear and A-weighted cases.



Fig. 1.2 Power modules available from G.R.A.S. for Type 40HF,
 Left: Single-channel Power Module Type 12HF
 Right: 10-Channel Module Type 12HM



Fig. 1.3 A Single-channel Low-noise Measuring System as described
 in this document, shown here with Tripod and Tripod Adapter
 (both available from G.R.A.S.)

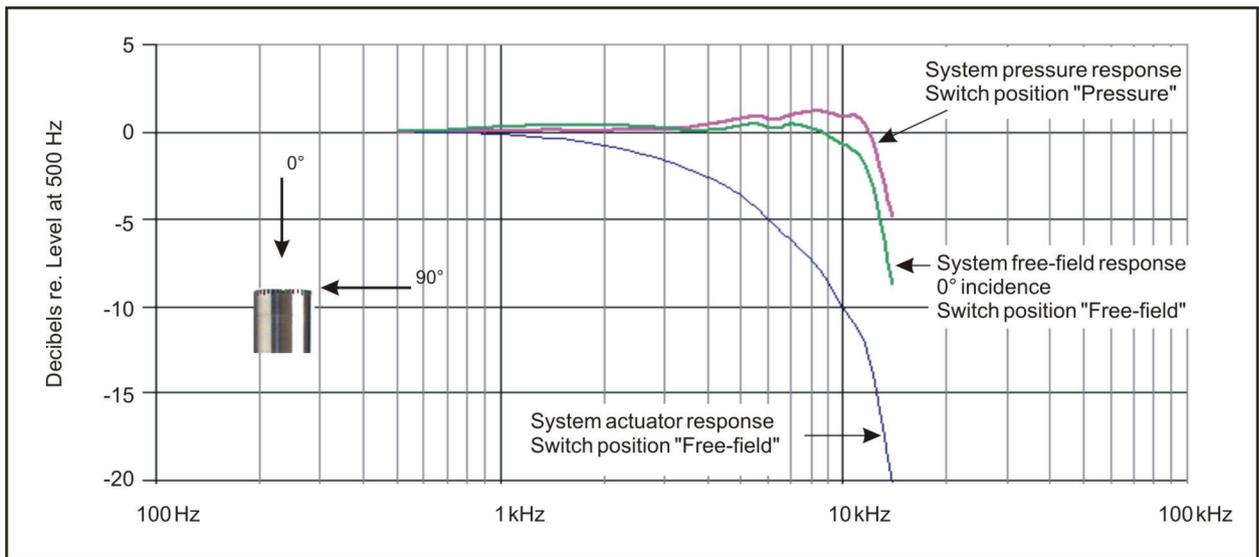


Fig. 1.4 Typical frequency response curves of Type 40HF

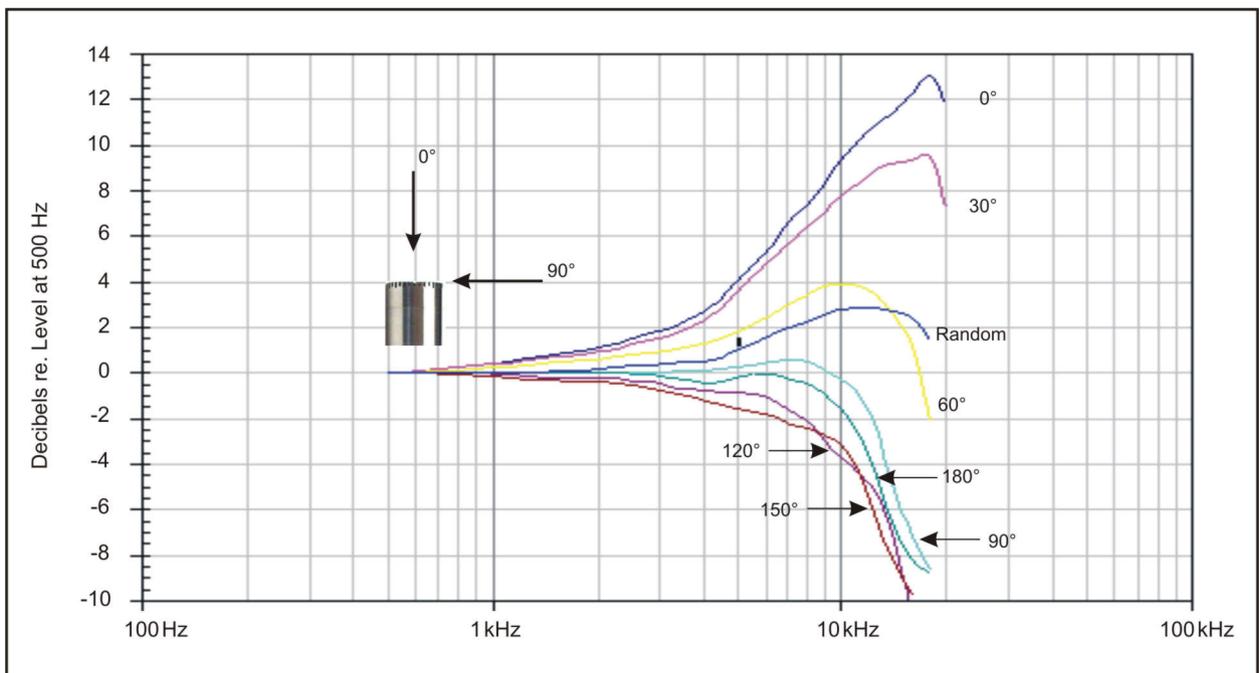


Fig. 1.5 Free-field corrections for various angles of incidence on the 1-inch Microphone Type 40EH.

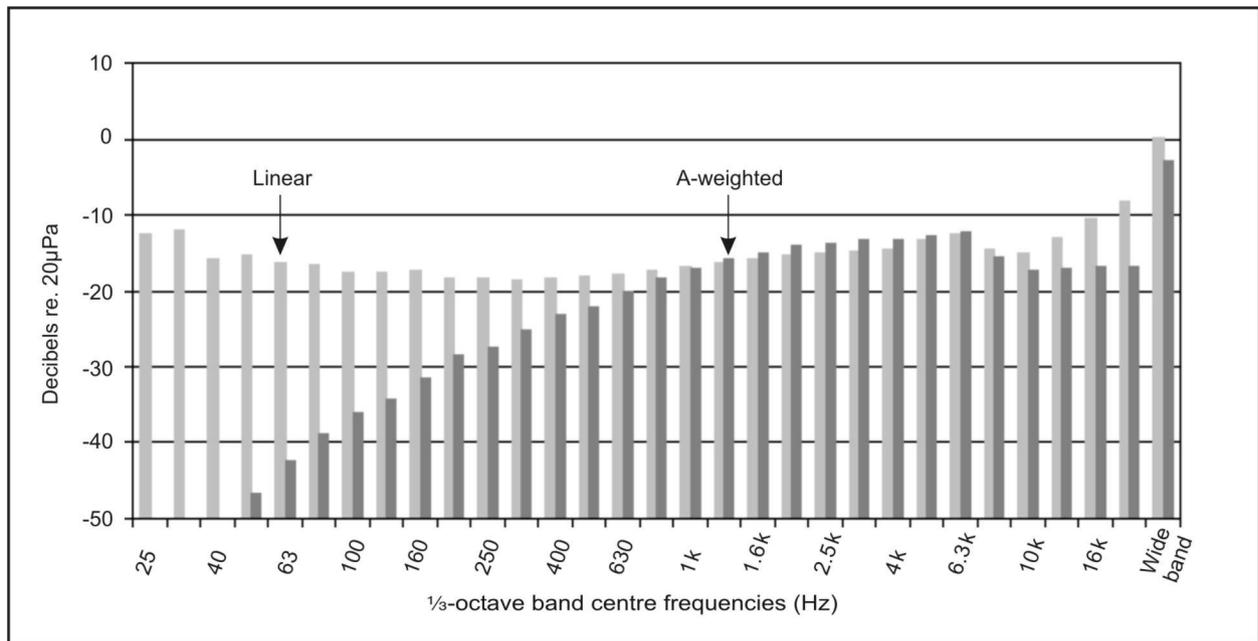


Fig. 1.6 Typical noise floor of Type 40HF for system and microphone. Shown in 1/3-octave bands for both the linear and A-weighted cases

2. Power Module Type 12HF

Since the microphone signal is amplified in the Preamplifier by 20 dB, the nominal system sensitivity at the output of the Power Module corresponds to 1.1 V/Pa. In other words when the measured output voltage from the Power Supply is 1.1 V RMS, the microphone is being subjected to 94 dB re. 20 μ Pa.

The actual sensitivity is quoted on the individual calibration chart supplied with each Type 40HF.

Important!

The Single-channel Power Module Type 12HF (available from G.R.A.S.) is a dedicated module. Under no circumstances should any other Power Module (apart from the multi-channel Power Module Type 12HM - also available from G.R.A.S.) be used with the 1-inch Low-noise Level Microphone System Type 40HF.

2.1 Front Panel

The front panel has the following features (see Fig. 2.1):

- Power switch with two LEDs: green “OK”, red “Batt. Low”.
If the power supply is correct, the green LED lights up. If the red LED lights up, either the batteries are low and should be changed (see section 2.3) or the external DC supply voltage is too low.
- Two-position switch for selecting frequency response, **Pressure** microphone operation or **Free Field** microphone operation:
Pressure - to select the output of the compensating filter which gives the system a linear pressure-frequency response.
Free Field - to select the output of the compensating filter which gives the system a linear free-field frequency response at 0° incidence.
- Overload-warning LED synchronised with the one on the Preamplifier Type 26HF (see Fig. 1.2)

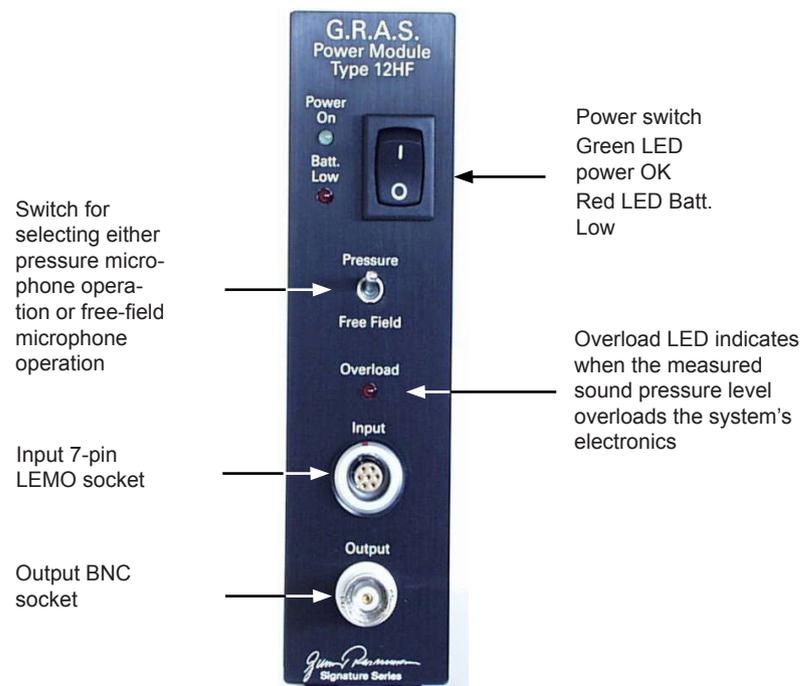


Fig. 2.1 Front panel of the Power Module Type 12HF

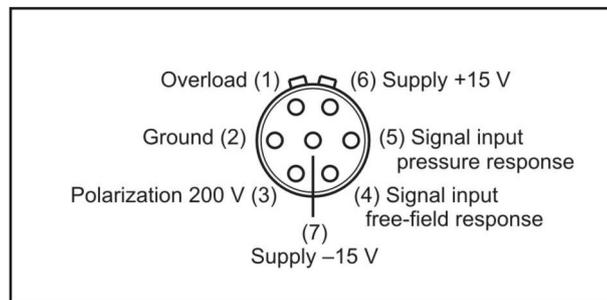


Fig. 2.2 7-pin LEMO EGA 307 1B input socket (external view)

- 7-pin LEMO EGA 307 1B input socket for the microphone and preamplifier signal. Wiring diagram shown in Fig. 2.2.
- BNC output socket for the selected compensated output signal

2.2 Rear Panel

The rear panel has the following features (see Fig. 2.3)

- Twist/release holder for 315 mA fast-blow fuse.
 - Input socket for an external voltage supply of 6 V - 20 V DC; centre pin +terminal. Use the Mains/line Adapter AB0005 supplied with the system.
 - Locking screw
- Unscrew to remove base plate and gain access to the battery pack (see section 2.3).

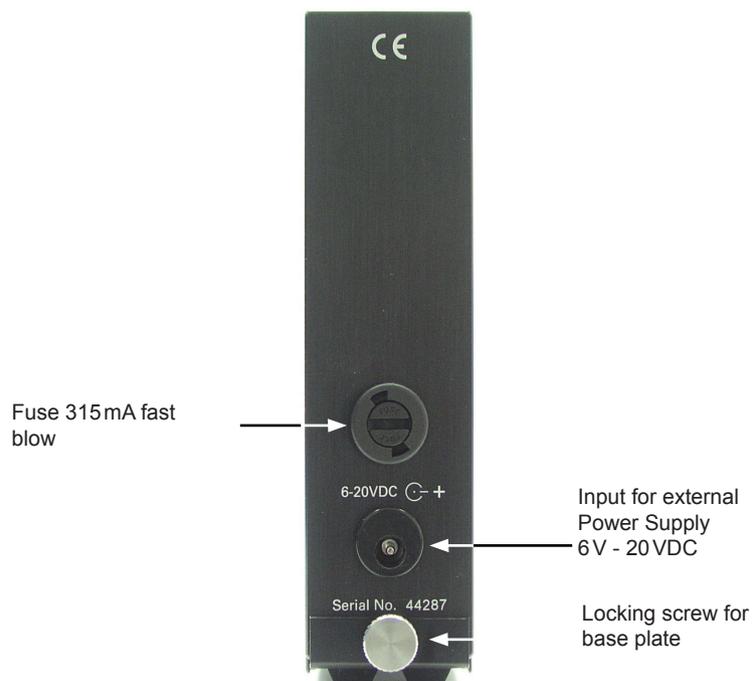


Fig. 2.3 Rear panel of the Power Module Type 12HF

2.3 Battery Pack

To gain access to the battery pack, unscrew the locking screw on the rear panel (Fig. 2.3) and slide the base plate off towards the rear. Pull out the battery pack See Fig. 2.4.

The battery pack consist of a battery holder and 4xLR14 (C) standard alkaline cells. When replacing the batteries, replace all of them making sure that the polarity is as indicated on the battery holder.



Fig. 2.4 Showing the battery pack of the Power Module Type 12HF

3. Operation

3.1 Calibration

3.1.1 Based on System Sensitivity

Since the microphone signal is amplified in the Preamplifier by 20 dB, the nominal system sensitivity at the output of the Power Module corresponds to 1.1 V/Pa. In other words when the measured output voltage from the Power Supply is 1.1 V RMS, the microphone is being subjected to 94 dB re. 20 μ Pa.

The actual sensitivity is quoted on the individual calibration chart supplied with each Low-noise Measuring System Type 40HF.

Based on this information, proceed as follows:

1. Connect the Type 40HF via its LEMO plug to the LEMO input socket of the Type 12HF.
2. Connect via a suitable cable the BNC output of the Type 12HF to the analyser to be used and switch both Power Module and analyser on.
3. Adjust the analyser to indicate 94 dB re. 20 μ Pa for an RMS input of *S* volts; where *S* is the system sensitivity of the Type 40HF as quoted on the calibration chart.

3.1.2 Pistonphone

A Pistonphone Type 42AA fitted with a Coupler RA0090 (both available from G.R.A.S.) can be used to produce 94 dB re. 20 μ Pa on the microphone of the Type 40HF.

Note: a Pistonphone fitted with a normal 1-inch coupler cannot be used because this will overload the system with a level of 114 dB re. 20 μ Pa.

Proceed as follows:

1. Connect the Type 40HF via its LEMO plug to the LEMO input socket of the Type 12HF.
2. Connect via a suitable cable the BNC output of the Type 12HF to the analyser to be used and switch both Power Module and analyser on.
3. Unscrew and remove the normal coupler of the Pistonphone.
4. Screw the Coupler RA0090 to the Pistonphone, see Fig. 3.1.
5. Mount the microphone of the Type 40HF in the Coupler as shown in Fig. 3.2 and switch the Pistonphone on.
6. Adjust the analyser to indicate 94 dB* re. 20 μ Pa.



Fig. 3.1 Pistonphone without its normal coupler and ready to accept the Coupler RA0090

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



Fig. 3.2 Pistonphone fitted with Coupler RA0090 and the microphone inserted into the Coupler

3.2 Measurements

1. Assemble the system as shown in Fig. 1.3.
2. Connect the output from the Power Module to an analyser.
3. Switch both Power Module and analyser on.
4. Calibrate the set up via one of the methods described in section 3.1.
5. Select which microphone operation to use via the switch on the front panel of the Type 12HF marked **Pressure / Free Field**.

At this point you can make your measurements but keep an eye on the overload warning LEDs to avoid overloading the system and invalidating the measurements.

4. Specifications

4.1 1-inch Low-noise Microphone System Type 40HF

Low-noise Measuring System Type 40HF comprising:

1-inch Microphone:	Type 40EH
Preamplifier:	Type 26HF (with 3 m cable and LEMO FGA.1B.307 plug)

Frequency response:

12.5 Hz - 4 kHz:	±1.0 dB
10 Hz - 10 kHz:	±2.0 dB
6 Hz - 12.5 kHz:	+2.0 dB, -3.0 dB

Nominal sensitivity:

System:	1.1 V/Pa
Microphone:	110 mV/Pa

Microphone polarisation voltage:

200 V

Dynamic range:

Upper limit:	110 dB re. 20 µPa
Lower limit:	-2 dBA re. 20 µPa (inherent noise)

Microphone capacitance:

45 pF

4.2 Single-channel Power module Type 12HF (separate order)

Input channel:

7-pin LEMO EGA 1B connector

Outputs channel:

BNC socket

Output impedance:

30 Ω

Polarisation voltage:

200 V

Power supply:

internal:	6 V from 4 x LR14 (C) standard alkaline cells
external:	6 V - 20 V DC via included Mains Adapter AB0010

Dimensions:

height:	132.6 mm (5¼ in)
width:	34.6 mm (1.3 in)
depth:	196.0 mm (7.7 in)

Weight:

620g (1.3lbs)

Accessories included:

Batteries: 4 x LR14 (C) standard alkaline cells
Mains/line Adapter: AB0010
Mains/line Adapter: AB0003 (US)

4.3 Common**Temperature range:**

-20 °C to +60 °C

Accessories available:

Power module (1 ch.): Type 12HF
Power module (10 ch.): Type 12HM
Windscreens (set of 5): AM0363
Pistonphone: Type 42AA
Pistonphone Coupler: RA0090 (for 94 dB re. 20 µPa)
Tripod: AL0006
Tripod Adapter: RA0093
3 m Ext. cable: AA0046
10 m Ext. cable: AA0047
30 m Ext. cable: AA0048

Manufactured to conform with:

CE marking directive:
93/68/EECWEEE directive:
2002/96/ECRoHS directive:
2002/95/EC