IEC 61672, class 1

SOUND LEVEL METER

Model : SL-4022

Your purchase of this SOUND LEVEL METER marks a step forward for you into the field of precision measurement.
Although this METER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

ISO 9001 QUALITY ASSURED FIRM SGS

UKAS QUALITY MANAGEMENT 005

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* Large LCD display, easy to read.
* Frequency weighting networks (A & C weighting) & Time weighting (Fast/Slow) are designed to meet the IEC 61672 Class 1.
* AC output for system expansion.
* Build in CALIBRATION VR on front panel.
* Changeable condenser microphone for high accuracy & long-term stability.
* Max. Hold function for stored the maximum value on display.
* Build max. hold reset switch.
* Warning indicator for over and under load.
* LCD display for low power consumption & clear read-out even in bright ambient light condition.
* Used the durable, long-lasting components, including a strong, light weight ABS-plastic housing case.
* Low battery indicator.

2. SPECIFICATIONS

Display	18 mm (0.7") LCD (Liquid Crystal Display), 3 1/2 digits.
Function	dB (A & C frequency weighting), Time weighting (Fast, Slow), Max. hold, AC output.
Measurement Range	*3 ranges :* 30 - 70 dB, 60 - 100 dB, 90 - 130 dB
Resolution	0.1 dB.

Accuracy *(23± 5 ℃)*	Frequency weighting (31.5 Hz to 16 KHz) meet IEC 61672 Class 1, calibrating input signal on 94 dB, then the accuracy of A/C weighting is specified as following : 31.5 Hz - ± 2.0 dB, 63 Hz - ± 1.5 dB, 125 Hz - ± 1.5 dB 250 Hz - ± 1.4 dB, 500 Hz - ± 1.4 dB, 1 KHz - ± 1.1 dB 2 KHz - ± 1.6 dB, 4 KHz - ± 1.6 dB, 8 KHz - + 2.1 dB to -3.1 dB, 12.5 KHz - + 3.0 dB to -6.0 dB, 16 KHz - + 3.5 dB to -17.0 dB.
Frequency Weighting Network	Characteristics of A & C.
	A weighting : The characteristic is simulated as "Human Ear Listing" response. Typical, if making the environmental sound level measurement, always select to A weighting.
	C weighting The characteristic is near the "FLAT" response. Typical, it is suitable for checking the noise of machinery (Q.C. check) & knowing the sound pressure level of the tested equipment.
Frequency	31.5 Hz to 16.0 KHz.
Calibrator	B & K (Bruel & Kjaer) : Multi-fuction acoustic calibrator, model : 4226.
Microphone	Electric condenser microphone.
Size of Microphone	0.5 inch standard size.
Range Selector	30 to 70 dB, 60 to 100 dB, 90 to 130 dB, 40 dB on each step, with over & under range indicating.

Time Weighting (Fast & Slow)	Fast - t= 200 ms, Slow - t = 500 ms, * "Fast" range is simulated the human ear response time. * "Slow" range is easy to get the avg. values of vibration sound level. * The "Fast" & "Slow" response range are designed to meet IEC 61672 Class 1 requirement.
Calibration	* Build in external calibration VR on front panel. * Calibrated via external SOUND CALIBRATOR. * Calibrated via internal 94 dB/1 KHz generator.
Output Signal	AC output - AC 750 mVrms corresponding to each range step.
Output Terminal	3.5 mm Dia. phone output terminal is provided for connection with analyzer, level recorder, tape recorder.
Operating Temperature	0 ℃ to 50 ℃ (32 ℉ to 122 ℉).
Operating Humidity	Less than 80% RH.
Power Supply	DC 9V battery x 2 PCs, 006P, MN1604 (PP3) or equivalent, heavy duty or alkaline type.
Power Consumption	Approx. DC 17 mA.
Weight	450 g/0.99 LB .
Dimension	260 x 87 x 36 mm (10.2 x 3.4 x 1.4 inch).
Standard Accessories	Instruction Manual ..... 1 PC. Calibration screw driver..... 1 PC. Hard carrying case (CA-06)..... 1 PC.
Optional Accessories	94 dB Sound Calibrator, model : SC-941.
	94/114 dB Sound Calibrator, model : SC-942.

3. FRONT PANEL DESCRIPTION

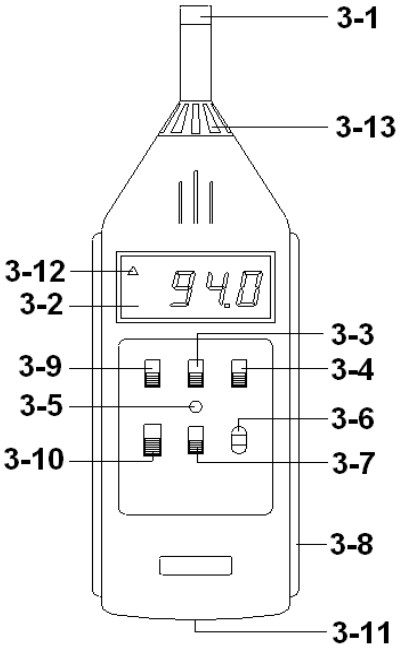

Fig. 1

3-1 Electric condenser microphone
3-2 Display
3-3 Time Weighting (Fast/Slow) selector
3-4 Max. hold & Instant display selector
3-5 Calibration VR (Accuracy adjust VR)
3-6 Reset button for Max. hold function
3-7 A/C weighting selector
3-8 Signal output terminal
3-9 Range selector
3-10 Power off/On/Internal calibration selector
3-11 Battery Compartment/Cover
3-12 Range upper/lower indicator
3-13 Microphone change installation

4. MEASURING PROCEDURE

1) Slide the " Power off/On selector " (3-10, Fig 1) to the " On " position.

0 = Off, 1 = On

2) For the instant display reading, slide the " Max. hold & Instant display selector " (3-4, Fig. 1) to the " Instant " position. General application always select the " Instant " function. For the " Max. hold " function, please refer the 4-7, page 6.
3) Slide the A/C weighting selector (3-7, Fig. 1) to "A" or "C" position for sound level measuring.

NOTE :

a. The characteristic table of A, C weighting, please ref. page 9.

b. The characteristic of A weighting is simulated as the "Human Ear Listening" response. Typically, if making the environmental sound level measurement, always select the A weighting typically.

c. The C weighting characteristic is near the "FLAT" response. Typically, it is suitable for checking the noise of machinery (Q.C. check) & knowing the real sound level of the tested equipment.

4) Determine proper measuring range by selecting the " Range selector " (3-9, Fig. 1) to minimize the tolerance of readout. When left corner of LCD show " ▲ " indicator, (3-12, Fig. 1), it shows the dB range selection is upper or lower setting. Slide range selector to other range for measuring.

5) According on various measuring sound source, select the " Time weighting selector " (3-3, Fig. 1) to " F " or " S " position.
Typically select the " Time weighting selector " to " F " position.

6) Hold the instrument in hand and point the microphone at measured noise source, the sound level will be displayed on "dB" (decibel) unit.

7) Max. hold

During the sound level measurement, if intend to hold the maximum (peak) value on display, slide " Max. hold & Instant display selector " (3-4, Fig. 1) to the " Max. hold " position.

Note :

a. During the operation of " Max. hold function ", push " Reset button for Max. hold function " (3-6, Fig. 1) once a while will reset the max. peak value.

b. If not use the " Max. hold " function, it should select the " Max. hold & Instant display selector " (3-4, Fig. 1) to the " Instant " position.

5. MEASURING CONSIDERATION

1) Please should select the proper weighting selector (A weighting or C weighting). The A weighting selector will be engaged normally.
2) Please select proper measurements range to minimize the tolerance of readout.

3) Please don't keep or operate the instrument at high temperature & humidity environment for a long period.
4) Keep microphone dry & avoid serious vibration.
5) **For general application of sound dB measurement, we recommend select the panel switch to the following position :**

3-3 Time Weighting (Fast/Slow) selector **Select to " F "**

3-4 Max. hold & Instant display selector **Select to " Instant "**

3-7 A/C weighting selector **Select to " A weighting "**

3-9 Range selector **Select to " 30 - 70 dB " or " 60 - 100 dB ".**

3-10 Power off/On/Internal calibration selector **Select to " 1 " (On).**

6. SIGNAL OUTPUT

1) The instrument is provided an 3.5 mm Dia. " Phone signal output terminal " (3-7, Fig. 1) for connecting with analyzer, level recorder, tape recorder, controller ...etc.
2) Output Signal :
AC output - AC 750 mVrms corresponding to each range step.

7. REPLACEMENT OF BATTERY

1) When the left corner of LCD display show " BAT ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after " Low battery indicator " appears before the instrument become inaccurate.
2) Slide the " Battery Cover " (3-11, Fig. 1) & take the battery away from the battery compartment..
3) Replace with 2 PCs 9V battery (heavy duty type) and reinstate the cover.

8. CALIBRATION

The sound level meter is built in the internal calibration " Calibration VR " (3-5, Fig. 1) on the front panel. Please according the following procedures to calibrate the instrument accurately, if it is necessary.

8-1 Calibrated via external SOUND CALIBRATOR

1) Prepare the optional " SOUND CALIBRATOR ", such as " SC-941 " or " SC-942 ". Power on the Sound Calibrator & plug calibrator output into the " Electric condenser microphone " head (3-1, Fig. 1) of the Sound Level Meter.
2) Slide the " Range selector " (3-9, Fig. 1) to " 60 - 100 dB " position.
3) Slide " Time Weighting selector " (3-3, Fig. 1) to " F " position.

4) Slide the " A/C weighting selector " (3-7, Fig. 1) to " A weighting " position.
5) Carefully adjust the " Calibration VR " (3-5, Fig. 1) with " - " screw driver (include accessory), until the display read within " 94.0 ± 0.2 " dB.

8-2 Calibrated via internal 94 dB generator The sound level meter is built in the internal standard 94 dB/1 KHz square wave generator for the purpose to calibrate come certain amplifier circuit (not the complete meter system). Please according the following procedures to calibrate the instrument before making operation, if the instrument not in use for a long time. The calibration method are similar as above 8-1, but not connect the external sound calibrator (SC-941, SC-942...), the other should slide " Power off/On/Internal calibration selector " (3-10 , Fig. 1) to the " CAL. " position " Carefully adjust the " Calibration VR " (3-5, Fig. 1) with " - " screw driver (included accessory), until the display read within " 94.0 0.2 " dB.

Note :
If intend to make calibration accurately of whole meter, it is recommended to use the calibrating procedures of above 8-1 " Calibrated via external SOUND CALIBRATOR "

9. FREQUENCY WEIGHTING CHARACTERISTICS OF A & C NETWORKS

Frequency	A Weighting Charac.	C Weighting Charac.	Tolerance (IEC 61672 Class 1)
31.5 Hz	-39.4 dB	-3 dB	± 2.0 dB
63 Hz	-26.2 dB	-0.8 dB	± 1.5 dB
125 Hz	-16.1 dB	-0.2 dB	± 1.5 dB
250 Hz	-8.6 dB	0 dB	± 1.4 dB
500 Hz	-3.2 dB	0 dB	± 1.4 dB
1 KHz	0 dB	0 dB	± 1.1 dB
2 KHz	+1.2 dB	-0.2 dB	± 1.6 dB
4 KHz	+1 dB	-0.8 dB	± 1.6 dB
8 KHz	-1.1 dB	-3 dB	+2.1 dB -3.1 dB
12.5 KHz	-4.3 dB	-6.2 dB	+3.0 dB -6.0 dB
16 KHz	-6.6 dB	-8.5 dB	+3.5 dB -17.0 dB

10. TIME WEIGHTING (FAST & SLOW) CHARACTERISTICS

Time Weighting Charac.	Max. response ref. continuous signal	Tolerance (IEC 61672 Class 1)
F (Fast)	- 1.0 dB	+ 1.0 dB,
S (Slow)	- 4.1 dB	± 1.0 dB

** Test under signal on 1,000 Hz/94 dB.*