

Sound Test Procedures

A.1 Test Values

The values to be measured shall be A-weighted sound pressure levels, in decibels, determined with the frequency weighting "A" and slow response as defined in IEC 61672-1 and 61672-2.

A.2 Test Site

A.2.1 Measurement of Sound pressure in Free Field

- a) The test area shall be a flat, open space with natural ground cover not exceeding 8 cm (3 in) in height, and free of any large reflecting surfaces such as signboards or buildings for a minimum distance of 30 m (100 ft) from the unit and microphone.
- b) The ambient sound level at the point of measurement (including wind effects) coming from sources other than the unit being tested shall be at least 10 dB(A) lower than the sound level of the unit.
- c) Measurements shall be made only when wind gusts are below 5.4 m/s (12 mph).

NOTE – For single microphone test set-ups the wind direction should be approximately perpendicular (± 45 degrees) to a line between the microphone and the test unit (see figure A.1).

- d) The ambient air temperature shall be 5°C (41°F), or greater at the time of the test.

A.2.2 Measurement of Sound in Sound Room (Alternate Method)

- a) An anechoic or semi-anechoic chamber may be used for conducting a sound level test provided the test results do not vary more than ± 1 dB(A) from the free field test results. If the variation exceeds ± 1 dB(A), the correction between the sound room measurement and free field sound measurement shall be applied to the result obtained from the sound room.
- b) Sound levels for distances exceeding the dimensions of the chamber, may be calculated from measurements taken in the chamber, if sufficient data is available to substantiate such calculations. Artificial grass (e.g., "Astro-Turf") is acceptable as floor covering in the chamber.

A.3 Test and Unit Conditions

- a) The unit shall be evaluated with all the standard attachments included with the unit by the manufacturer. The attachments shall be mounted in accordance with the manufacturer's instructions.
- b) All readings shall be taken with the unit running at wide-open throttle and in a normal operating position with the lowest part of the nozzle at least 51 mm \pm 25.4 mm (2 in \pm 1 in) above the ground cover. To ensure consistency in readings, a support may be attached to the end of the nozzle, provided the support is demonstrated not to affect the sound level readings.
- c) The unit shall be tested warmed up with the carburetor adjusted in accordance with the manufacturer's recommendations.

A.4 Instrumentation

A.4.1 Calibration

- a) Before and after each series of measurements an acoustical calibrator with an accuracy of at least +0.5 dB(A) shall be applied to the microphone to check the calibration of the entire measuring system at one or more frequencies in the range from 200 to 1000 Hz.
- b) The calibrator shall be checked at least once every year to verify that its output is within specifications.
- c) The measuring equipment shall be allowed to reach a steady state (stabilized) temperature before it is calibrated.

A.4.2 Engine Speed Indicator

An engine speed indicator shall be used to check the speed of the engine. It shall have an accuracy of \pm 3% of measured value.

A.4.3 Microphone

Suitable measuring devices are sound level meters meeting or exceeding the requirements of a Type 1 instrument in accordance with IEC Publication 651. It is recommended that a microphone with a diameter not greater than 13 mm (0.5 in) be used for the measurements. A wind screening attachment to the microphone may be used, if this is allowed for, if necessary, in the calibration and does not alter the measured sound level by more than 0.5 dB(A) as a consequence of its effect on the omnidirectional characteristics of the microphone.

A.4.4 Meter

Either of the following systems may be used:

- a) A precision sound level meter that meets the Type I requirements of ANSI S1.4 for direct measurements.
- b) A data acquisition system that meets the requirements of SAE J184.

A.5 Microphone Position

A.5.1 Microphone Position (Operator's Ear)

A.5.1.1 Mounting of the Machine on the Test Fixture

Use a fixture as specified in ISO 22868. The machine shall be attached to the test fixture so that the middle of the grip of the handle to which the throttle trigger is fitted is 775 mm \pm 10 mm (30.5 in \pm 0.4 in) above the ground. The lowest point of the air nozzle shall be 51 mm \pm 25 mm (2 in \pm 1 in) above the ground.

NOTE – A flexible mount is recommended to avoid any structural resonance.

A.5.1.2 Position of the Microphone

The microphone shall be located 875 mm \pm 10 mm (34.4 in \pm 0.4 in) vertically above the center of the handle on which the throttle control is fitted. If a throttle control is not provided, use the center of the main support handle as the reference point. The microphone shall be aimed vertically towards the ground.

A.5.2 Microphone Position (Bystander Sound Pressure)

- a) The microphone shall be placed 15 m (50 ft) from the operator and 1.2 m (4 ft) above ground. If an anechoic chamber is used and the 15 m (50 ft) distance cannot be met, the distance may be shortened provided the resulting measurements are corrected to yield results for 15 m (50 ft).
- b) The microphone shall be positioned with its axis of highest sensitivity generally parallel to the ground and pointed toward the unit operator.

A.6 Other Influences

Not more than one person, other than the observer reading the meter, shall be within 17.7 m (58 ft) of the unit, and that person shall be directly behind the observer reading the meter, in line with the microphone and the observer. The individual reading the meter shall be at least 2.4 m (8 ft) behind the microphone. All other observers should be no closer than 30.5 m (100 ft) to the unit or microphone.

A.7 Test Procedure

A.7.1 Test Procedure (Operator's Ear)

- a) Four measurements shall be taken. The variation of four values shall not be greater than 2 dB(A). If this variation is exceeded, the test shall be repeated until four consecutive tests fall within a variation of 2 dB(A).
- b) The reported sound level shall be the arithmetic average of the four averaged readings taken and rounded to the nearest whole decibel (ANSI/ASTM E29).
- c) The engine speed during the measurements shall be kept within ± 120 rpm.

A.7.2 Test Procedure (Bystander Sound Pressure)

- a) Measurements shall be taken at every 45 degrees (a total of 8 different positions). Five readings should be taken at each position for at least 5 seconds apart. Each reading shall be an average of at least 2 seconds duration. The arithmetic average of the five readings is to be used in the calculation of the reported sound level. If the test data at each position vary more than 2 dB(A), the test shall be repeated until five sequential readings are within 2 dB(A) at each measuring position. If an analog sound level meter is used, the average of the highest and the lowest indicated readings shall be used.
- b) The unit shall rotate 360 degrees with respect to the microphone in a fixed position. Alternately, an array of 8 microphones may be used and all data may be collected at one time.
- c) The reported sound level shall be the arithmetic average of the eight averaged readings taken and rounded to the nearest whole decibel (ANSI/ASTM E29).
- d) The engine speed during the measurements shall be kept within ± 120 rpm.

A.8 Information to be Recorded

(See figures A.1 and A.2 in this Annex for sample data sheets.)

A.8.1 Unit Under Test

Description of the unit including engine displacement, manufacturer, type, serial number, and attachments.

A.8.2 Test Environment

- a) Describe the test environment.
- b) If outdoors, sketch the location of the engine with respect to surrounding terrain, including a physical description of the test environment (the nature of the ground plane shall be described).
- c) If indoors, provide a correlation figure between indoor and outdoor measurement.

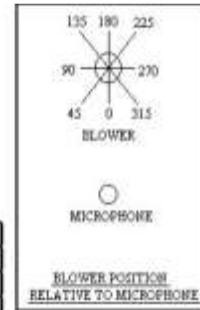
A.8.3 Instrumentation

a) Equipment used for the measurements, including name, type, serial number and manufacturer. b) Date and place of the most recent calibration of the acoustical calibrator.

A.8.4 Test Data

a) The location of the microphone position (a sketch or photograph may be included, if necessary.) b) The sound pressure levels of the background noise. c) Engine speed, measurement values and arithmetic averages. d) Air temperature, wind speed, and barometric pressure. e) The date and place of the measurements.

Ambient Conditions	
Temperature	
Baro. Press.	
R. Humidity	
Wind (mph)	
Noise (dB(A))	
DATE	



Manufacturer Sound Level Meter (S/N: xxxx) / Manufacturer Microphone (S/N: xxxx)	
Test Was Conducted by:	
Date of last calibration of acoustical calibrator:	
Location of Test:	
Pipe Configuration Tested:	

Model #	SERIAL #	RPM=	Sound Pres. Readings (dB(A))				Average
0							
45							
90							
135							
180							
225							
270							
315							
							Average:
							Label value:

Position (Deg)	Sound Pres. Readings (X 10 ⁻⁶ Pa)				
0	20.0	20.0	20.0	20.0	20.0
45	20.0	20.0	20.0	20.0	20.0
90	20.0	20.0	20.0	20.0	20.0
135	20.0	20.0	20.0	20.0	20.0
180	20.0	20.0	20.0	20.0	20.0
225	20.0	20.0	20.0	20.0	20.0
270	20.0	20.0	20.0	20.0	20.0
315	20.0	20.0	20.0	20.0	20.0

AVG. (X 10 ⁻⁶ Pa)	dB(A)
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
20.0	0.0
AVERAGE=	0.0
LABEL VALUE=	0

Figure A.1—Sample Blower Bystander Sound Level Data Sheet