

LUBELL LABS LL-9162 UNDERWATER TRANSDUCER



**LUBELL LABS INC.
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Lubell LL-9162 Underwater Acoustic Transducer

**Broadband Piezoelectric Underwater Transducer for
Military and Scientific Applications**

SPECIFICATIONS

- **Frequency Range:** 200Hz-20kHz
- **Maximum SPL:** 186dB/uPa/m @ 1 kHz, 190dB/uPa/m @ 10 kHz
- **Maximum Voltage:** 50V rms
- **Maximum Current:** 5A at 50% D.C.
- **Impedance:** 16 ohms nominal - use only with specified resistor and fuse.
- **Operating Depth:** 6' min/60' max
- **Dimensions:** 7.8"D x 11"W x 11"H, 17 lbs (w/o cable).
- **Bulkhead Connector:** Subconn MCBH3MSS
- **Cable:** Subconn MCIL3F//MCDLS-F on 50 ft 18/3 SOOW
- **Price:** \$2667
- **Warranty:** 2 year limited
- **Options:** Pressure fitting and plug (-PF/P @ \$95); external power resistor (\$65); internal 7.5 ohm resistor (-R @ \$95); Custom cable (call).
- **Uses:** Projector, underwater loudspeaker, hydrophone

The Lubell Labs LL9162 is a high-power full-range piston piezoelectric underwater acoustic transducer developed and manufactured by Lubell Labs of Columbus, Ohio USA. The LL9162 is intended for scientific and military uses including harbor defense and interrogation of suspicious divers. The LL9162 may be used portably, or permanently mounted at depths from 6 feet to 60 feet in fresh or salt water.

The LL-9162 has a useful frequency range of 200Hz-20kHz, a nominal impedance of 16 ohms, and an SPL of 186dB/uPa/m @ 1 kHz and 190dB/uPa/m @ 10 kHz with 50 Vrms applied. The LL-9162 may be connected to a GFCI protected amplifier with a transformer isolated speaker output up to 300 watts @ 8 ohms. An external series resistor and fuse *must* be used with the LL-9162 (per instructions). Frequencies below 200Hz must be rolled off at 12dB/octave when reproducing broadband.

The LL-9162 withstands extreme conditions by virtue of its rugged PVC and stainless steel construction. The LL-9162 includes an underwater pluggable cable that can be field replaced by the operator. The LL-9162 operates at depths between 6' to 60', and may be ordered with optional pressure fitting and custom cable.

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Instructions for Use of LL-9162 Underwater Transducer

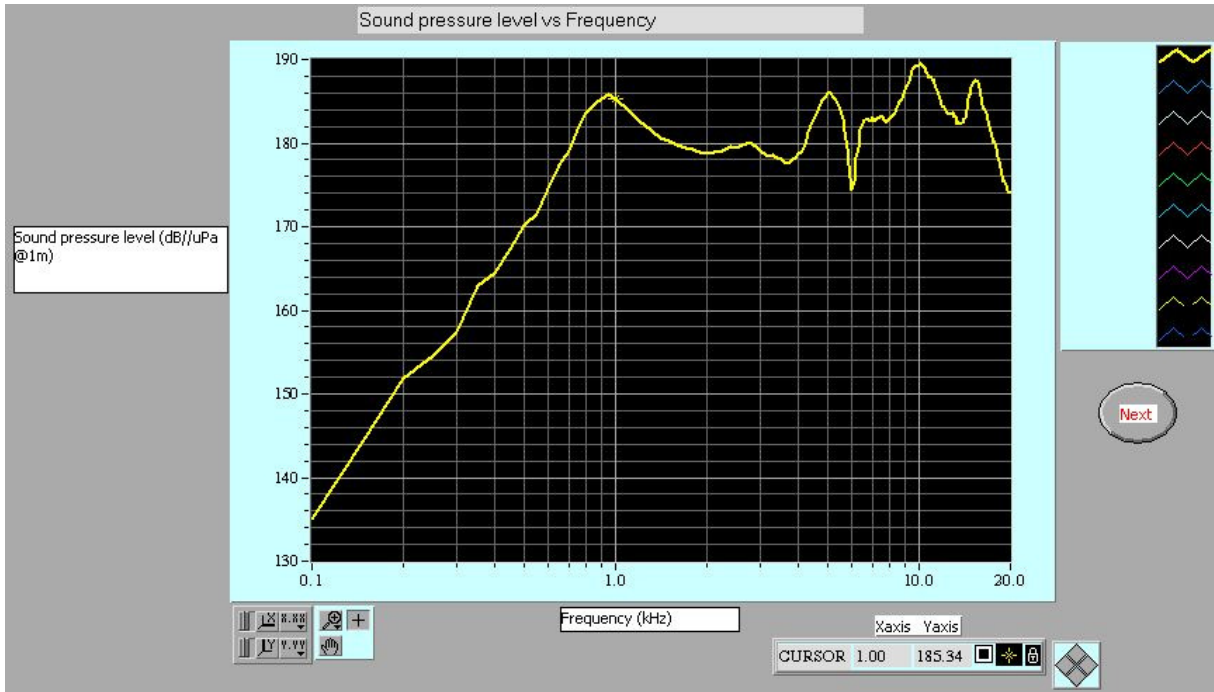
1. The LL-9162 must have 8.5 ohms of total external resistance (cable and external resistor) installed between the bulkhead connector and the amplifier. Failure to install proper resistance and fusing will result in damage to transducer. The following chart lists standard detachable cable lengths/gauges available with the LL-9162, and the corresponding external series resistor that must be installed in the white speaker lead to obtain safe operation and published results:
 - A. LL9162-50': 18/3 SOOW cable @ 1.0 ohm round trip - use 7.5 ohm/75W external resistor.
 - B. LL9162-150': 18/3 SOOW cable @ 2.0 ohms round trip - use 6.5 ohm/75W ext. resistor.
 - C. LL9162-500': 16/3 SOOW cable @ 4.2 ohms round trip - use 4.3 ohm/50W ext. Resistor.
2. Maximum voltage is limited to 50 volts rms, *or* to the voltage that produces 5 amps of current, whichever is smaller. To prevent damage to the LL-9162: a.) Use an amplifier no greater than 300 watts @ 8 ohms (50 Vrms); b.) Install a 3A slo-blow fuse in series with the white speaker lead; c.) Install power resistor (per section 1) in series with the white speaker lead; d.) Do not reproduce frequencies below 200Hz unless a 200Hz high-pass filter (12dB/octave) is installed between the signal source and the amplifier.
3. Maximum Current: 5A @ 50% duty cycle
4. Depth range: 6 ft - 60 ft (1.83 m - 18.3 m)
5. Do not exceed 1 volt on the underwater speaker when operating out of the water.
6. CAUTION! If LL-9162 fitted with optional Swagelok SS-400-1-OR pressure fitting, internal pressure must not exceed external pressure by more than 2.5 psi or damage will occur. Use bladder type compensation only for safety and convenience, as pressure compensation is automatic. Internal volume of LL9162 is 1833 cc's. Use only Swagelok mating fittings, and follow Swagelok tightening guide carefully.
7. For safety of diver or dolphin, connect the LL-9162 to a UL listed PA amplifier with a transformer isolated output only or an industrial amp with an unbalanced output. Power amplifier from a grounded GFCI electrical outlet only per National Electrical Code. The LL-9162 can also be powered from a 12 volt or 24 volt battery operated amplifier providing that there is no external connection to 120/240V mains powered equipment.
8. The sound level produced in water close to the LL9162 can be harmful to human hearing.

Electrical Connector and Guidelines

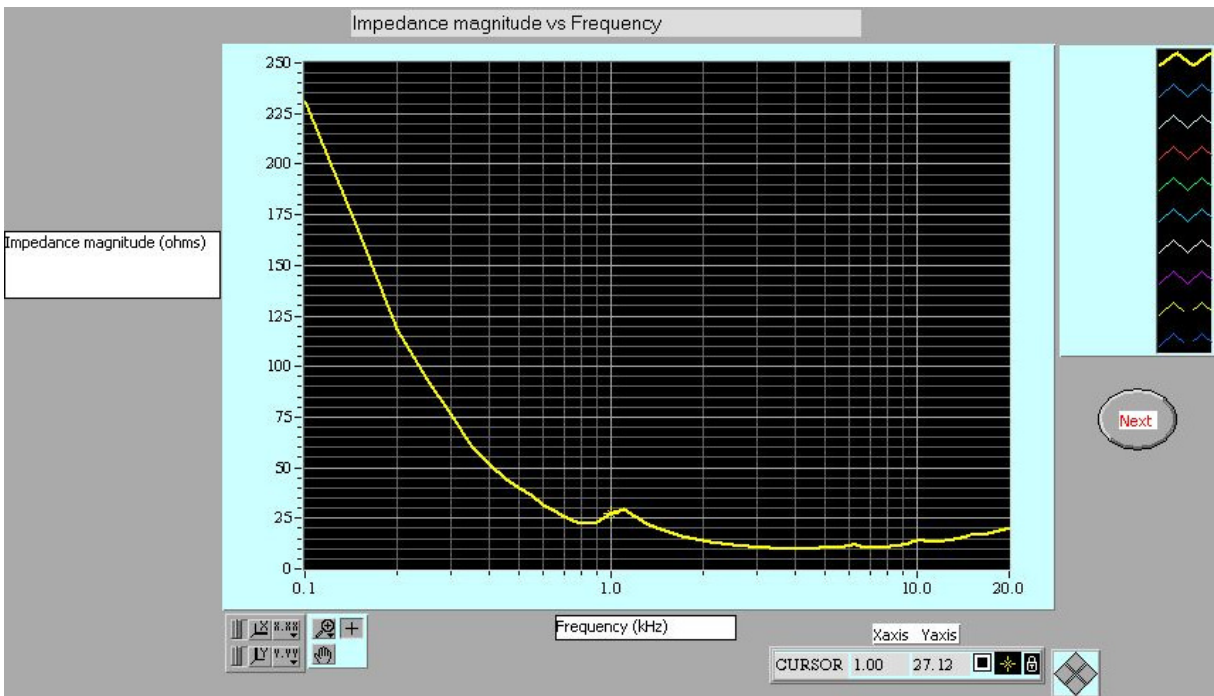
A Subconn MCBH3MSS bulkhead connector is factory installed on the LL9162. A mating Subconn MCIL3F // MCDLS-F overmolded to 50 ft SOOW cable is also included. Coding: White (hot); Black (return/ground); Green (ground)

1. Lubricate cable and bulkhead O-rings with Molykote 44 medium before every mating.
2. Avoid sharp bends at cable entry to connector.
3. Do not pull on cable to disconnect, or use cable to lift or lower the LL9162.
4. Install a strain relief on cable to prevent movement and damage to the connector.

NUWC Niantic Calibration of LL9162 #102212 on 30 Oct 2001
Test Depth: 28 ft. Test Distance: 9.8 ft. Orientation: 0 deg Horizontal



Graphic 1: LL-9162 w/75' SJOW cable (1.0 ohm), 7.5 ohm series resistor, 50 Vrms drive



Graphic 2: LL-9162 w/75' SJOW cable (1.0 ohm), 7.5 ohm series resistor, 10 Vrms drive