

## Condenser Microphone CM16/CMPA

The condenser microphone consists of two pieces. The cylindrical preamplifier module with the 5-pole XLR connector (1 - CMPA) is connected to the microphone capsule (2 - CM16) via a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages.



The integrated pre-amplifier has an internal compensation circuit that slightly boosts frequencies above 50 kHz.

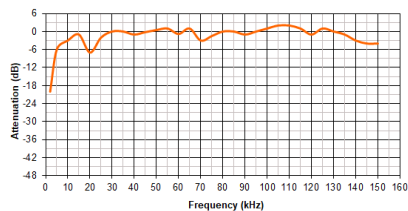
Due to the principle of the amplifier, the actual gain depends on the capacitance of the microphone capsule. Therefore, larger diaphragms (e.g. the Polaroid transducer) will provide higher output voltages than the smaller CM16 capsule.

The integrated polarization voltage generator will take up to 20 seconds after switch-on until the full voltage of about 200V (and the maximum sensitivity) is reached.

## Condenser Microphone Capsule CM16

The microphone capsule consists of a thin metalized polyester film and a metal back plate. Do not touch the diaphragm because its metalization could be destroyed. It is recommended to use the capsule always with the protective grid. However, depending on the grid type, the frequency response may be degraded in some way. Therefore, it is possible to remove or replace the grid by releasing the nuts on the front side (use the supplied 5.5 mm box spanner).

Due to its thin metalization, the diaphragm may deteriorate especially under humid conditions. Therefore, it is recommended to store the microphone in a dry place. Spare capsules are available on request and deteriorated diaphragms will be replaced by Avisoft Bioacoustics at a small fee. With some skill, it would also be possible to replace the membrane foil on your own (by releasing the screws on the back of the capsule).



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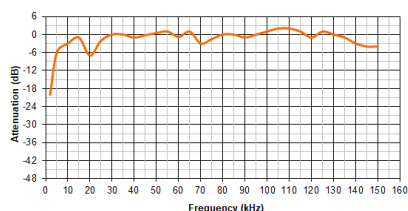
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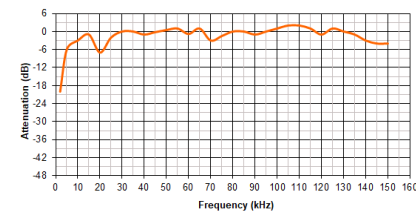
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## Condenser Microphone CM16/CMPA-P48

The condenser microphone CMPA-P48/CM16 consists of three components. The microphone capsule CM16 (#1) is connected to the cylindrical preamplifier module CMPA (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The P48 polarization voltage supply unit (#3) provides the polarization voltage for the microphone capsule and the XLR-3 connector that allows to connect the microphone to a standard microphone input that supplies P48 phantom power at a current of up to 10mA. The CMPA module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



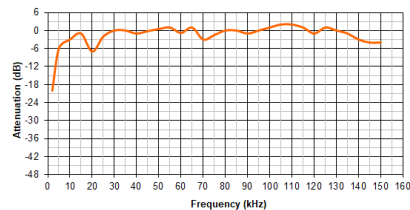
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Due to its thin metalization, the diaphragm may deteriorate especially under humid conditions. Therefore, it is recommended to store the microphone in a dry place. Spare capsules are available on request and deteriorated diaphragms will be replaced by Avisoft Bioacoustics at a small fee. With some skill, it would also be possible to replace the membrane foil on your own (by releasing the screws on the back of the capsule).



## Condenser Microphone CM16/CMPA-P48

The condenser microphone CMPA-P48/CM16 consists of three components. The microphone capsule CM16 (#1) is connected to the cylindrical preamplifier module CMPA (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The P48 polarization voltage supply unit (#3) provides the polarization voltage for the microphone capsule and the XLR-3 connector that allows to connect the microphone to a standard microphone input that supplies P48 phantom power at a current of up to 10mA. The CMPA module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



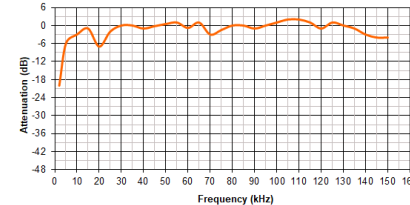
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## Condenser Microphone CM16/CMPA-P48

The condenser microphone CMPA-P48/CM16 consists of three components. The microphone capsule CM16 (#1) is connected to the cylindrical preamplifier module CMPA (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The P48 polarization voltage supply unit (#3) provides the polarization voltage for the microphone capsule and the XLR-3 connector that allows to connect the microphone to a standard microphone input that supplies P48 phantom power at a current of up to 10mA. The CMPA module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



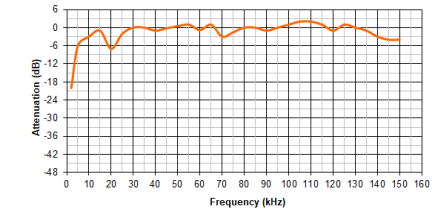
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Due to its thin metalization, the diaphragm may deteriorate especially under humid conditions. Therefore, it is recommended to store the microphone in a dry place. Spare capsules are available on request and deteriorated diaphragms will be replaced by Avisoft Bioacoustics at a small fee. With some skill, it would also be possible to replace the membrane foil on your own (by releasing the screws on the back of the capsule).



## Condenser Microphone CM16/CPMA-5V

The condenser microphone CM16/CPMA-5V consists of three components. The microphone capsule CM16 (#1) is connected to the cylindric preamplifier module CPM5 (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The polarization voltage supply and preamplifier unit (#3) provides the polarization voltage for the microphone capsule and includes an adjustable 40 dB preamplifier with a balanced output. The CPM5 module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



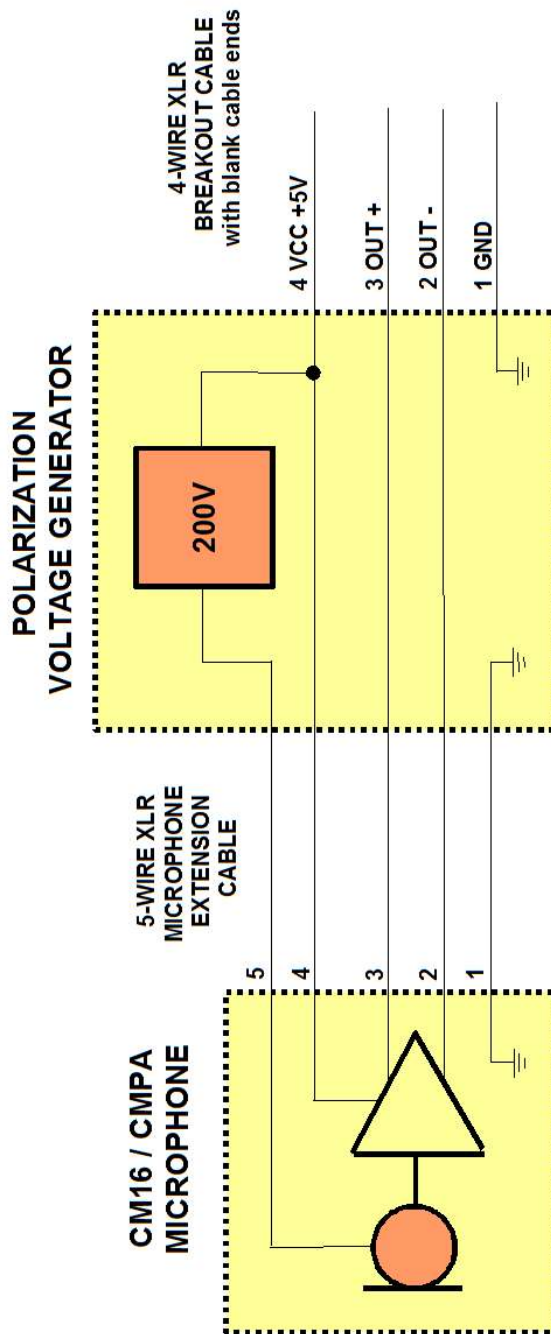
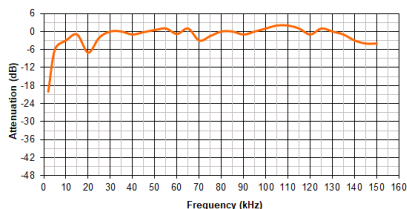
The integrated preamplifier has an internal compensation circuit that slightly boosts frequencies above 50 kHz.

The integrated polarization voltage generator will take up to 20 seconds after switch-on until the full voltage of 200V and the maximum sensitivity is reached.

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The microphone capsule consists of a thin metalized polyester film and a metal back plate. Do not touch the diaphragm because its metalization could be destroyed. It is recommended to use the capsule always with the protective grid. However, depending on the grid type, the frequency response may be degraded in some way. Therefore, it is possible to remove or replace the grid by releasing the nuts on the front side (use the supplied 5.5 mm box spanner).

Due to its thin metalization, the diaphragm may deteriorate especially under humid conditions. Therefore, it is recommended to store the microphone in a dry place. Spare capsules are available on request and deteriorated diaphragms will be replaced by Avisoft Bioacoustics at a small fee. With some skill, it would also be possible to replace the membrane foil on your own (by releasing the screws on the back of the capsule).



## Condenser Microphone CM16/CMPA40-5V

The condenser microphone CM16/CMPA40-5V consists of three components. The microphone capsule CM16 (#1) is connected to the cylindrical preamplifier module CMPA (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The polarization voltage supply and preamplifier unit (#3) provides the polarization voltage for the microphone capsule and includes an adjustable 40 dB preamplifier with a balanced output. The CMPA module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



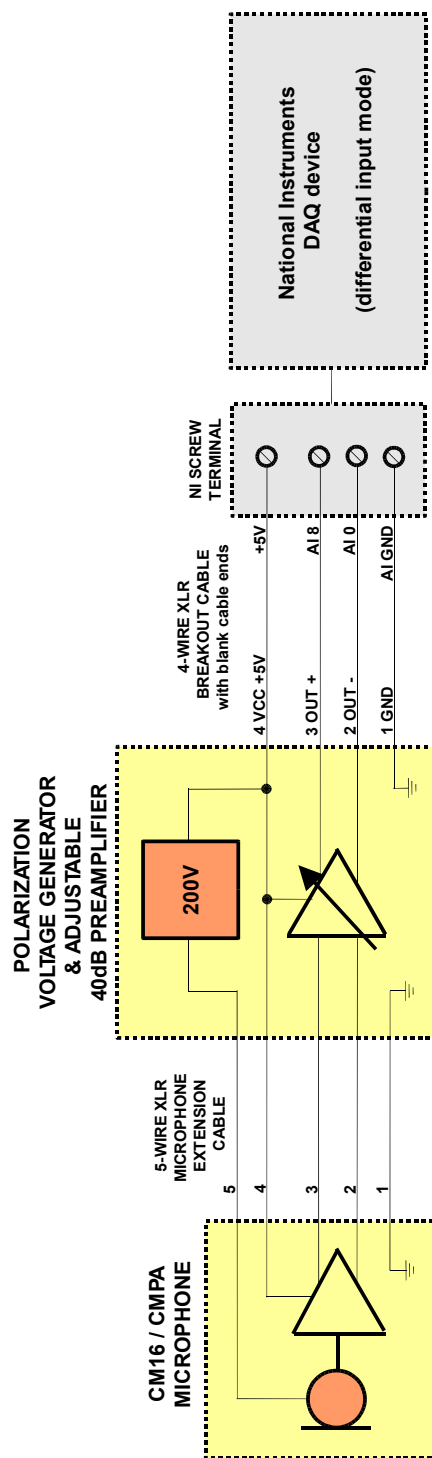
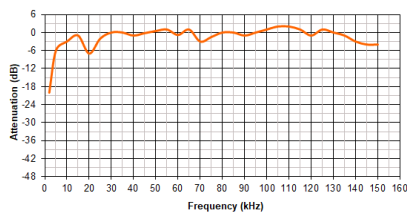
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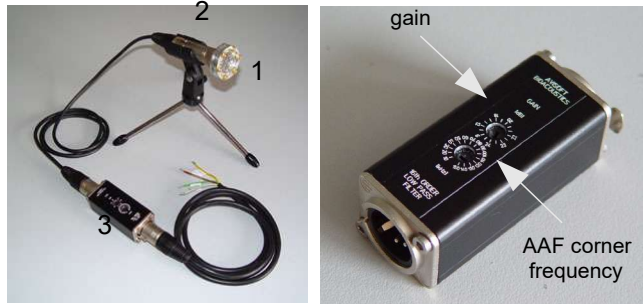


The connection scheme of the XLR-4 connector is as follows:

- pin 1 (black) : GND
- pin 2 (white) : OUT-
- pin 3 (green) : OUT+
- pin 4 (yellow) : +5VDC +-10% power supply

## Condenser Microphone CM16/CPA48AAF-5V

The condenser microphone CM16/CPA48AAF-5V consists of three components. The microphone capsule CM16 (#1) is connected to the cylindrical preamplifier module CPA (#2) by means of a 2.5 mm thread. This allows to replace the capsule easily. For proper operation, both this 2.5 mm thread and the 17 mm thread on the preamplifier module must be fastened. However, use only moderate forces in order to prevent mechanical damages. The polarization voltage supply and preamplifier unit (#3) provides the polarization voltage for the microphone capsule and includes an adjustable 24 dB preamplifier and anti-aliasing filter. The CPA module (#2) can be attached either directly to the polarization module (#3) or via the supplied 5-pole XLR extension cable.



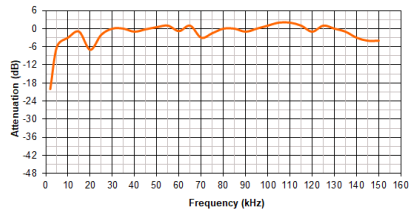
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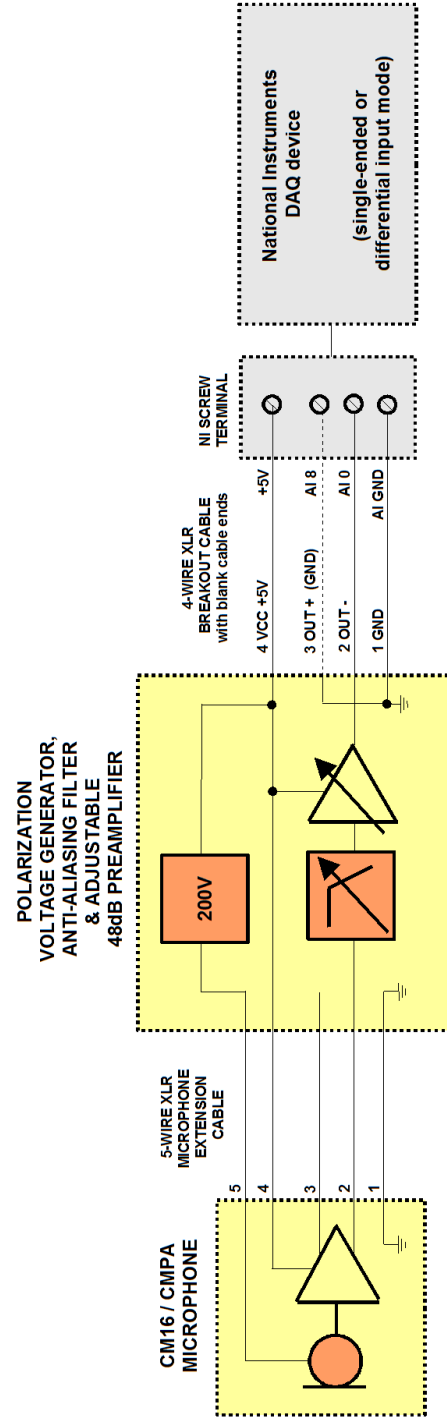
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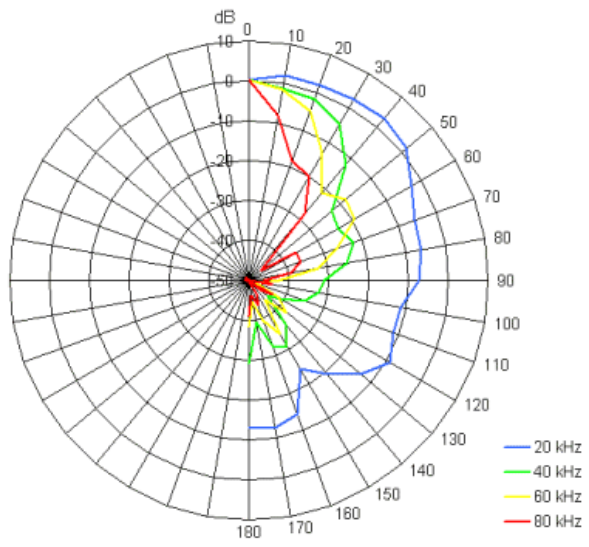
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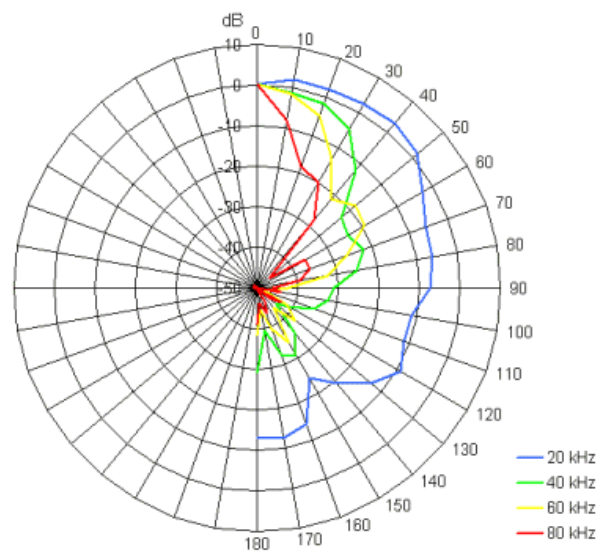


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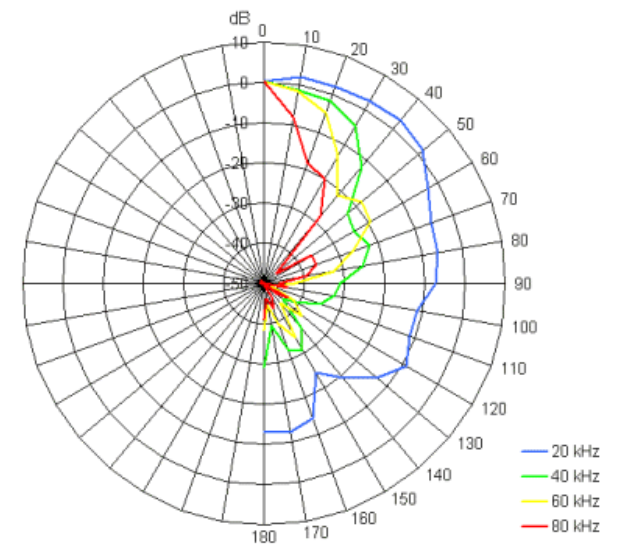
- pin 1 (black) : GND
- pin 2 (white) : OUT-
- pin 3 (green) : OUT+ (GND)
- pin 4 (yellow) : +5VDC +-10% power supply



Polar Diagram



Polar Diagram



Polar Diagram

## USB-powered microphone heating HCM16

The HCM16 microphone heating module for the CM16/CMPA microphone can increase the temperature of the microphone capsule by about 10 Kelvin above the ambient temperature, which should prevent condensation under difficult environmental conditions, such as dew or rain.

The USB B connector can be connected either to a free USB port of the PC that is running the UltraSoundGate unit or alternatively to a separate USB power supply unit or battery.

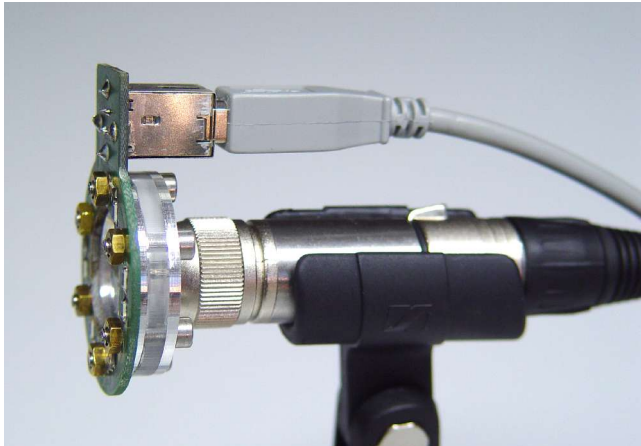
### Installation

Mount the heating module to the CM16 microphone capsule in such a way that the resistor chips on it face outwards (see picture). The protective grid might be still inserted between the microphone capsule and the heating module. However, the efficiency (the thermal contact) would be better without the grid.

Under some circumstances, the USB cable connection between the heating module and the computer might cause electrical interferences that are caused by a ground loop. In this case, the ground connection to the heating module through the USB connector should be removed (USB pin 4). This can be achieved for instance by using a modified USB cable whose ground wire (USB pin #4, black) has been cut. The required ground connection to the computer would then be established exclusively through the microphone and the UltraSoundGate ground rail.

### Specifications

Electric power requirements : 0.9 W (180 mA @ 5V)  
Absolute maximum power: 3.0 W (330 mA @ 9V)  
Maximum supply voltage: 9 V



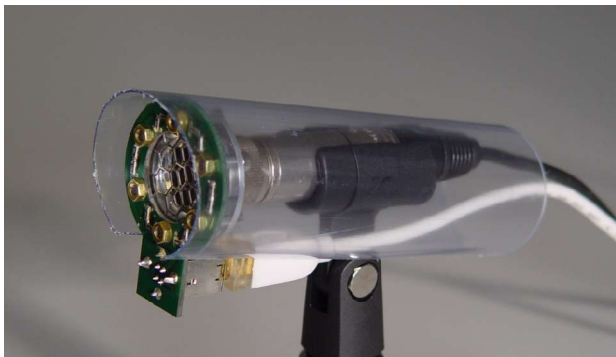


## Rain Protection Tube

The supplied rain protection tube is intended for protecting the microphone and the XLR cable connector against direct rain.

Note that the installed tube will slightly affect the frequency response and the polar pattern of the microphone. This effect can be minimized by adjusting the tube in such a way that there is only a short canopy (about 10 mm) in front of the microphone capsule.

The rain protection tube for the CM16/CMPA microphone can also be combined with the microphone heating.



## Refurbishing Kit for the Condenser Microphone Capsule CM16

The refurbishing kit allows to replace deteriorated diaphragms of the CM16 condenser microphone capsules. The supplied mounting frame enables a proper assembly. However, a moderate level of skill is required for this procedure.

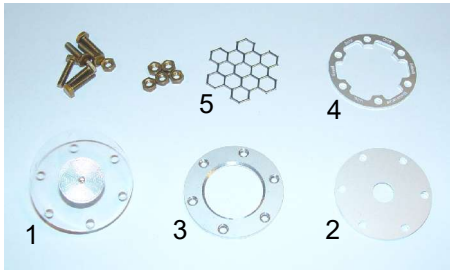
1. First remove the 6 nuts from the front of the CM16 capsule and remove the protective grid by using the supplied M3 nut driver.



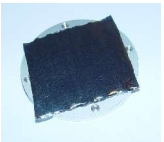
2. Remove the M3 screws from the back of the CM16 capsule.



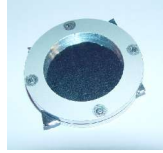
The capsule is now completely disassembled (except of the aluminum back plate that is still mounted on the acrylic disk). The old diaphragm foil can be thrown away.



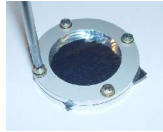
3. Place one of the supplied diaphragm foils onto the mounting ring with with the thread holes. The non-conductive side of the foil that is marked by a black cross should be on top. Handle the foil on its edges only.



4. Put the second mounting frame ring (the one without threads) onto the foil and align the mounting holes. Make sure that there are no wrinkles on the foil.



5. Fix the foil between the two rings by fastening the supplied screws.



6. Place the acrylic disk [1] onto the non-conductive (marked) side of the foil and add the aluminum disk [2]. The lowering of that disk must be outside. Align the mounting holes of the two disks.

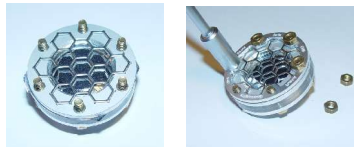


7. Turn the entire arrangement, add the aluminum ring [3] and align it to the holes of the two disks on the opposite side. First insert one screw from the back side and fasten it while applying a moderate tension to the diaphragm. Then add the other 5 screws one after another.



8. Push the newly mounted capsule down and pull it out of the mounting frame.

9. Center the protective grid [5] on the capsule and fasten it by the cover ring [4] using the 6 six nuts.



## UltraSoundGate Charge Amplifier with adjustable Hi-Pass Filter

The UltraSoundGate Charge Amplifier can be used to connect a hydrophone directly to the an UltraSoundGate xx16x main unit. The integrated adjustable high-pass filter allows rejecting unwanted low-frequency noise.



The gain of the charge amplifier depends both on the nominal capacitance of the connected hydrophone and the selected input capacitance of the amplifier (Gain = 20 log (capacitance of the hydrophone / selected input capacitance)). A hydrophone capacitance of 3nF and an input capacitance of 1nF would provide a gain of approximately 10 dB. The alternate input capacitance of 100pF would rise the gain to 30 dB.

The black rotary knob selects the cut-off frequency of the high-pass filter. The filter attenuation is 6dB / octave below the selected cut-off frequency. The labels are valid for an input capacitance of 1nF. If the alternate 100pF setting has been selected, all frequency labels must be multiplied by factor 10.

### High-pass cut-of frequencies and input impedances

rotary switch setting	cut-off frequency at 1nF	cut-off frequency at 100 pF (*)	input impedance
10	10 Hz	100 Hz	15 MOhm
25	25 Hz	250 Hz	6.8 MOhm
50	50 Hz	500 Hz	3,3 MOhm
100	100 Hz	1 kHz	1.5 MOhm
250	250 Hz	2.5 kHz	680 kOhm
500	500 Hz	5 kHz	330 kOhm
1k	1 kHz	10 kHz	150 kOhm
2.5k	2.5 kHz	25 kHz	68 kOhm
5k	5 kHz	50 kHz	33 kOhm
10k	10 kHz	100 kHz	15 kOhm
25k	25 kHz	250 kHz	6.8 kOhm
50k	50 kHz	500 kHz	3.3 kOhm

Care should be taken while connecting the hydrophone to the charge amplifier. Under some circumstances it is possible that the hydrophone or its cable have been electrostatically charged with high voltages (several thousands volts). These high voltages may damage the sensitive input stage of the amplifier (ESD). In order to maintain the maximum possible sound quality (low noise), there is no full ESD protection circuit at the amplifier input. Therefore, the hydrophone and its cable should be discharged before connecting them to the charge amplifier. This can be done by short-circuiting the hydrophone connector. Additionally, the amplifier should be switched off (either by disconnecting the amplifier from the USG main unit or by disconnecting the USG device from the PC) before connecting the hydrophone cable and the input impedance should be reduced by selecting a high cut-off frequency (greater than about 1 kHz). Once the hydrophone is connected to the amplifier, there is no further danger because any potential high voltages would be terminated by the internal resistors of the amplifier.

- 1: GND
- 2: positive signal output
- 3: negative signal output
- 4: +5V supply voltage (should not exceed 5.5V)
- 5: not connected

## P48 Charge Amplifier with adjustable Hi-Pass Filter

The Avisoft Bioacoustics Charge Amplifier can be used to connect a passive hydrophone to any microphone input that supplies 48V phantom power at 10 mA. The integrated adjustable high-pass filter allows rejecting unwanted low-frequency noise.



The gain of the charge amplifier depends both on the nominal capacitance of the connected hydrophone and the selected input capacitance of the amplifier ( $\text{Gain} = 20 \log(\text{capacitance of the hydrophone} / \text{selected input capacitance})$ ). A hydrophone capacitance of 3nF and an input capacitance of 1nF would provide a gain of approximately 10 dB. The alternate input capacitance of 100pF would rise the gain to 30 dB.

The black rotary knob selects the cut-off frequency of the high-pass filter. The filter attenuation is 6dB / octave below the selected cut-off frequency. The labels are valid for an input capacitance of 1nF. If the alternate 100pF setting has been selected, all frequency labels must be multiplied by factor 10.

### High-pass cut-of frequencies and input impedances

rotary switch setting	cut-off frequency at 1nF	cut-off frequency at 100 pF (*)	input impedance
10	10 Hz	100 Hz	15 MOhm
25	25 Hz	250 Hz	6.8 MOhm
50	50 Hz	500 Hz	3,3 MOhm
100	100 Hz	1 kHz	1.5 MOhm
250	250 Hz	2.5 kHz	680 kOhm
500	500 Hz	5 kHz	330 kOhm
1k	1 kHz	10 kHz	150 kOhm
2.5k	2.5 kHz	25 kHz	68 kOhm
5k	5 kHz	50 kHz	33 kOhm
10k	10 kHz	100 kHz	15 kOhm
25k	25 kHz	250 kHz	6.8 kOhm
50k	50 kHz	500 kHz	3.3 kOhm

Care should be taken while connecting the hydrophone to the charge amplifier. Under some circumstances it is possible that the hydrophone or its cable have been electrostatically charged with high voltages (several thousands volts). These high voltages may damage the sensitive input stage of the amplifier (ESD). In order to maintain the maximum possible sound quality (low noise), there is no full ESD protection circuit at the amplifier input. Therefore, the hydrophone and its cable should be discharged before connecting them to the charge amplifier. This can be done by short-circuiting the hydrophone connector. Additionally, the amplifier should be switched off (either by disconnecting the amplifier from the recording device or by switching off the recorder) before connecting the hydrophone cable and the input impedance should be reduced by selecting a high cut-off frequency (greater than about 1 kHz). Once the hydrophone is connected to the amplifier, there is no further danger because any potential high voltages would be terminated by the internal resistors of the amplifier.

## UltraSoundGate 1/4" Mic Power Module with 7-pin LEMO 1B input connector

The 1/4" microphone power module allows to connect 1/4" (or 1/8") measurement microphones directly to the UltraSoundGate xx16x units, which can greatly simplify the use of measurement microphones in the field (otherwise a separate power supply module / conditioning amplifier would be required). It is powered from the UltraSoundGate base unit and includes a low-noise preamplifier and a switchable 15 kHz high pass filter.

Compatible 1/4" preamplifiers are for instance G.R.A.S. 26AC, B&K 2670 or Microtech Gefell MV 302.



### Specifications

Input connector : female 7-pin LEMO 1B socket

Frequency range : 20 Hz ... 200 kHz

Gain : 30 dB

Inherent noise (20Hz-20kHz) : 0.5  $\mu$ V (-125 dBu)

Optional high-pass filter cut-off frequency : 15 kHz

Preamplifier supply voltage (LEMO pin 6): 28 V

Max preamplifier supply current available at pin 6: 1 mA

Polarization voltage (LEMO pin 3): 200 V (derived from the USG base unit)

Current drawn from the +5V USG base unit power supply rail (G.R.A.S. 26AC attached): 25 mA

Physical dimensions : 85 x 32 x 26 mm

Weight : 90 g

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