

UPM 550 · UPM 550-1

One universal level  
meter which replaces  
a whole variety of  
measuring  
instruments

Up until now, in order to test AF equipment such as tape recorders, HiFi amplifiers or infrared units in the laboratory, testing bay and service department

a variety of instruments had to be used. They were all necessary because each instrument could only measure certain quantities. Such an arrangement was obviously expensive in terms of both space and money. Sennheiser is now offering a practical solution in the form of a new generation of UPM modular measuring instruments. Firstly, these measuring instruments are fitted with four permanently installed filters and secondly, it is also possible to insert two additional filters. In this way each UPM can be specially fitted out to meet specific demands, then neither are the filter cards highly expensive nor does the assembly/modification take up a lot of time. Due to the multitude of available ranges one can measure voltages of a few  $\mu\text{V}$  right up to 300 V and thus easily get round those specialized measuring problems. Furthermore, their true RMS measurement of distortion, AM modulation factor, noise and pulse voltages means that the UPM units always give exact and clearly defined values. The peak rectification of the UPM 550 is in total accordance with the DIN norm for noise-level meters 45 405.

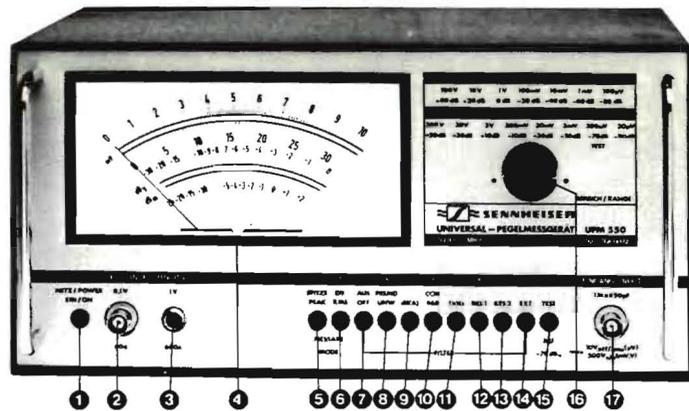
**The perfect design**

The fully transistorized precision measuring instruments UPM 550 and UPM 550-1 are fitted with an easy to use rotary switch for selecting the 15 overlapping ranges. Overload protection for the sensitive inputs is of course provided. Because the housing is not directly connected to the ground wire, measuring errors due to ground loops are avoided.

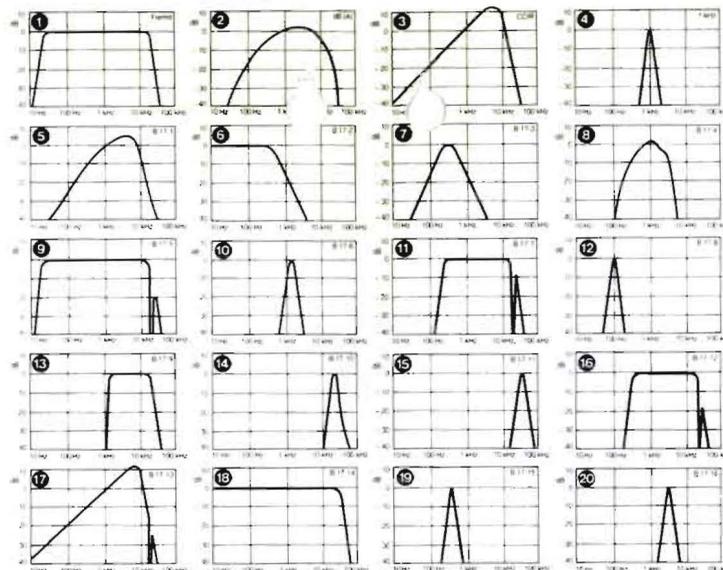
Both measuring instruments feature as standard a CCIR earcurve filter and a 1000 Hz filter for selective measurements as well as a dBA filter and a noise weighting filter for measurements according to DIN 45500 (page 4). The UPM 550-1 is also fitted, as standard, with the basic card for additional filter (UPM 550-B 17) and furthermore possesses an extra filter (UPM 550-B 17-9) for measuring the harmonic distortion of a 1 kHz fundamental wave.

Moreover, connecting sockets permit the use of external 600  $\Omega$  filters such as octave or third octave filters. Insertion loss from 1 to 15 dB can be corrected with a potentiometer.





### The UPM 550 range of plug-in filters

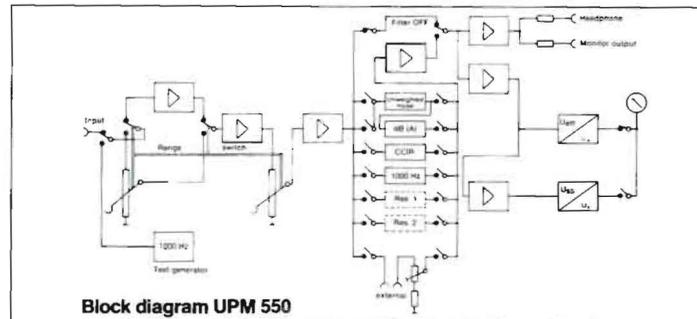


- 1 **Weighting filter** For the measurement of external voltages according to DIN 45 405, DIN 45 500, CCIR 268-1.
- 2 **dB(A) Noise weighting filter** For weighted noise measurements according to DIN 45 633.
- 3 **CCIR noise weighting filter** For weighted noise measurements according to CCIR 468-1 and DIN 45 405 (formulated 1978).
- 4 **1000-Hz Band pass filter** For selective measurements at 1 kHz according to DIN 45 301.
- 5 **UPM 550-B 17-1** Weighted noise-voltage filter according to DIN 45 405 (1967 version).
- 6 **UPM 550-B 17-2** Rumble-unweighted voltage filter according to DIN 45 539.
- 7 **UPM 550-B 17-3** Rumble-weighted noise voltage filter according to DIN 45 539.
- 8 **UPM 550-B 17-4** Telephone noise weighting filter according to CCITT P.53.
- 9 **UPM 550-B 17-5** Weighted noise filter for FM stereo, for the frequency range from 30 Hz to 15 kHz according to DIN 45 500, also features additional 19 kHz trap.
- 10 **UPM 550-B 17-6** 1500 Hz Band pass filter. Suitable for selective measurements at 1.5 kHz.
- 11 **UPM 550-B 17-7** Noise weighting filter for the frequency range 300 Hz to 15 kHz according to the norm 45 301. Filter is fitted with additional 15.625 kHz trap for the suppression of line frequency in TV sets.
- 12 **UPM 550-B 17-8** 100 Hz Band pass filter.
- 13 **UPM 550-B 17-9** 1000 Hz harmonic distortion filter.
- 14 **UPM 550-B 17-10** 19 kHz filter for selective measurement of 19 kHz pilot tone levels according to DIN 45 500.
- 15 **UPM 550-B 17-11** Filter for selective measurements of the 38 kHz auxiliary carrier used in stereo multiplex signal processing according to DIN 45 500.
- 16 **UPM 550-B 17-12** Weighted noise filter for the range 300 Hz to 15 kHz according to DIN 45 301, with additional trap at 19 kHz.
- 17 **UPM 550-B 17-13** Noise weighting filter according to CCIR 468-1 and DIN 45 405 (formulated 1978) with an additional trap at 19 kHz.
- 18 **UPM 550-B 17-14** 30 kHz low pass filter.
- 19 **UPM 550-B 17-15** 330 Hz band pass filter.
- 20 **UPM 550-B 17-16** 3000 Hz band pass filter.

\* Fitted as standard in the UPM 550 and the UPM 550-1.  
 † Fitted as standard in the UPM 550-1.

### UPM 550

- 1 Mains switch
- 2 Output 60 Ω/0.1 V
- 3 Output 600 Ω/1 V
- 4 Mechanical zero adjustment
- 5 Quasi-peak rectification according to DIN 45 405
- 6 RMS-rectification according to DIN 45 500 resp. DIN 45 633
- 7 Filter "Off"
- 8 Filter "Unweighted S/N ratio" to DIN 45 405
- 9 Filter "dB (A) - weighted S/N-ratio" to DIN 45 500 resp. DIN 45 633
- 10 Filter "weighted S/N ratio" to CCIR
- 11 Filter 1 kHz
- 12 Reserve filter
- 13 Reserve filter
- 14 External filter
- 15 Function "Test"
- 16 Range selector switch
- 17 Input



Block diagram UPM 550

### The practical level meter

By using the UPM measuring system one can, to quote but one example, determine the maximum modulation of a tape recorder by measuring the third harmonic of a recorded 333 Hz signal. Erasure attenuation is easily determined with the help of the 1000 Hz filter. All of the UPM 550's amplifiers have a wide overload range. For instance, the filter-preamplifier can be modulated by more than 50 dB above full scale deflection by a sinusoidal voltage without distorting the signal. The overload margin of the final amplifier for the two outputs is still sufficient to amplify without

distortion a pulse amplitude ten-times greater than that of the sinusoidal voltage usually necessary for full scale deflection of the meter.

The built-in calibration generator can be used for checking the amplifier stages. As required by the DIN norm for noise-level meters No. 45405, the indication on the meter is so set that when measuring a sinusoidal voltage - also when peak reading is selected - the RMS value is given and not the peak value (which is higher by a factor of 1.41). This means that when measuring a continuous sinusoidal waveform of a single frequency one will get the same read-out with either mode of rectification (PEAK or RMS)

### The easy-to-survey readout

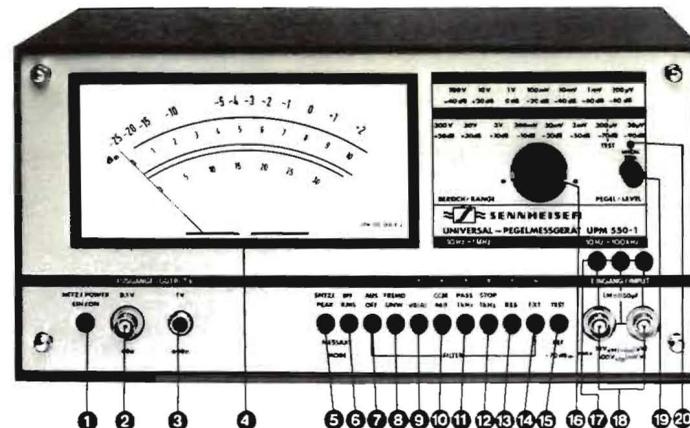
The panel meter has two voltage scales which are used alternately in sequence with the meter-ranges so that simple multiples of ten can be used to interpret the readings. Two further dB-scales with range steps of exactly 10 make it easy to read the dB levels as well. The dBm values are related to 0.775 V (corresponding to 1 mW at 600 Ω) and the dBV scale is referred to 1 V. LED-indicators for all range positions and operational modes are provided. As well as being shown as a meter reading the signal being tested can at the same time be monitored with an

oscilloscope at the 60 Ω output and with normal Sennheiser headphones (e. g. HD 414-14) at the 600 Ω-output socket.

### Universal Level Meter UPM 550-1

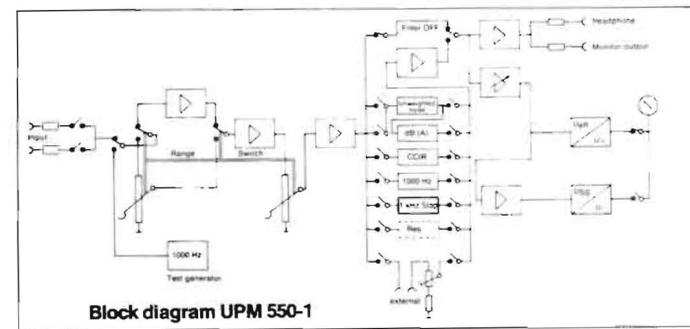
Along with all the standard features of the UPM 550 the UPM 550-1 also possesses the following extras:

- 1. Two switchable inputs for measuring stereo equipment



### UPM 550-1

- 1 Mains switch
- 2 Output 60 Ω/0.1 V
- 3 Output 600 Ω/1 V
- 4 Mechanical zero adjustment
- 5 Quasi-peak rectification according to DIN 45 405
- 6 RMS-rectification according to DIN 45 633
- 7 Filter "Off"
- 8 Filter "Unweighted S/N ratio" to DIN 45 405
- 9 Filter "dB (A)-weighted S/N ratio" to DIN 45 500 resp. DIN 45 633
- 10 Filter "Weighted S/N ratio" to CCIR
- 11 1000 Hz filter
- 12 Filter "1 kHz STOP"
- 13 Reserve filter
- 14 External filter
- 15 Function "Test"
- 16 Range selector switch
- 17 Input selector switch
- 18 Inputs
- 19 Level adjustment with switch
- 20 LED indicator UNCAL



Block diagram UPM 550-1

- 2. Additional filter UPM 550-B 17-9 for measuring the harmonic distortion of a 1 kHz signal is mounted on the basic board UPM 550-B 17.
- 3. Level adjuster (can be deactivated) for the meter deflection. With the help of this the deflection can be set at any reference level required.
- 4. Because the basic board is already fitted with an additional filter this means that there is only room for one more
- 5. Due to the need for more space on the front panel the carrying handles have been replaced by cap nuts.
- 6. On the indicating scale the positions of the voltage- and dB-scales were changed around.

This gives a better reading of the dB values from the dBm scale now situated in the upper region of the meter face. In order to retain a sufficiently large voltage scale the dBV scale was omitted

### UPM 550 with modified scale

If so required the UPM 550 can be delivered fitted with the special scale of the UPM 550-1. If this is the case the indication "with scale 2" will suffice when placing the order

## Technical Data

	UPM 550 (Order no. 1290)	UPM 550-1 (Order no. 1740)
Voltage ranges . . . . .	0 - 30/100/300 $\mu$ V 1/3/10/30/100/300 mV 1/3/10/30/100/300 V - 100 . . . + 50 dBv (selective - 115 . . . + 50 dBv) - 98 . . . + 52.5 dBm (selective - 115 . . . 52.5 dBm)	0 - 30/100/300 $\mu$ V 1/3/10/30/100/300 mV 1/3/10/30/100/300 V - 98 . . . + 52.6 dBm (selective - 115 + 52.6 dBm)
Frequency range for peak rectification Ranges 1 mV to 100 V . . . . .	10 Hz . . . 1 MHz	10 Hz . . . 1 MHz
Ranges 30 $\mu$ V to 300 V . . . . .	10 Hz . . . 100 kHz	10 Hz . . . 100 kHz
For RMS-rectification in all ranges . . . . .	10 Hz . . . 100 kHz	10 Hz . . . 100 kHz
Tolerance for sinusoidal voltages and measurements without filters: Amplifier (mV and V-ranges) . . . . .	20 Hz . . . 200 kHz $\pm$ 3% 10 Hz . . . 20 Hz and 200 kHz . . . 1 MHz $\pm$ 5% 20 Hz . . . 50 kHz $\pm$ 3% 10 Hz . . . 20 Hz and 50 kHz . . . 100 kHz $\pm$ 5% $\pm$ 0.5%	20 Hz . . . 200 kHz $\pm$ 3% 10 Hz . . . 20 Hz and 200 kHz . . . 1 MHz $\pm$ 5% 20 Hz . . . 50 kHz $\pm$ 3% 10 Hz . . . 20 Hz and 50 kHz . . . 100 kHz $\pm$ 5% $\pm$ 0.5%
Amplifier ( $\mu$ V-ranges) . . . . .		
Input divider . . . . .	$\pm$ 0.5%	$\pm$ 0.5%
Scale linearity of rectifiers at RMS-rectification . . . . .	$\pm$ 0.5%	$\pm$ 0.5%
Indicating instrument . . . . .	tolerance class 1 0	tolerance class 1 0
Scale linearity of rectifiers at RMS-rectification . . . . .	$\pm$ 0.5%	$\pm$ 0.5%
at peak-rectification . . . . .	$\pm$ 3%	$\pm$ 3%
Dynamic properties for peak-rectification . . . . .	according to DIN 45 405	according to DIN 45 405
for RMS-rectification . . . . .	according to DIN 45 633 and 45 500	according to DIN 45 633 and 45 500
Frequency of built-in calibration generator . . . . .	1000 Hz $\pm$ 1%	1000 Hz $\pm$ 1%
Voltage constancy . . . . .	0.2 $^{\circ}$ /K, 0 $^{\circ}$ bis + 50 $^{\circ}$ C	0.2 $^{\circ}$ /K, 0 $^{\circ}$ bis + 50 $^{\circ}$ C
input impedance . . . . .	1 M $\Omega$ /50 pF	1 M $\Omega$ /50 pF
Max. tolerable D.C.-voltage at the input . . . . .	400 V	400 V
Max. tolerable A.C.-voltage at the input. in the mV and V-ranges . . . . .	500 V <sub>peak</sub>	500 V <sub>peak</sub>
in the $\mu$ V-ranges . . . . .	10 V <sub>RMS</sub>	10 V <sub>RMS</sub>
Noise voltage referred to input: unterminated, screened input without filters . . . . .	$\leq$ 15 $\mu$ V eff	$\leq$ 15 $\mu$ V eff
unterminated, screened input with 1000 Hz filter . . . . .	$\leq$ 2 $\mu$ V eff	$\leq$ 2 $\mu$ V eff
terminated with 10 k $\Omega$ without filters . . . . .	$\leq$ 10 $\mu$ V eff	$\leq$ 10 $\mu$ V eff
with 1000 Hz filter . . . . .	$\leq$ 1 $\mu$ V eff	$\leq$ 1 $\mu$ V eff
Outputs		
Monitor output . . . . .	e.m.f. = 100 mV at f.s.d. Ri = 60 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = 100 mV at f.s.d. Ri = 60 $\Omega$ $\pm$ 3% (short circuit proof)
Headphone output . . . . .	e.m.f. = 1 V at f.s.d. Ri = 600 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = 1 V at f.s.d. Ri = 600 $\Omega$ $\pm$ 3% (short circuit proof)
Filter output . . . . .	e.m.f. = approx. 20 mV at f.s.d. Ri = 600 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = approx. 20 mV at f.s.d. Ri = 600 $\Omega$ $\pm$ 3% (short circuit proof)
Input impedance of the external filter input . . . . .	600 $\Omega$ $\pm$ 20%	600 $\Omega$ $\pm$ 20%
Sensitivity of the external filter input . . . . .	2.5 . . . 12.5 mV, adjustable on rear panel	2.5 . . . 12.5 mV, adjustable on rear panel
Max. e.m.f. of outputs		
Filter output . . . . .	28 V <sub>pp</sub> (10 V <sub>RMS</sub> for sinusoidal voltages)	28 V <sub>pp</sub> (10 V <sub>RMS</sub> for sinusoidal voltages)
Monitor output . . . . .	2.8 V <sub>pp</sub> (1.0 V <sub>RMS</sub> for sinusoidal voltages)	2.8 V <sub>pp</sub> (1.0 V <sub>RMS</sub> for sinusoidal voltages)
Headphone output . . . . .	28 V <sub>pp</sub> (10 V <sub>RMS</sub> for sinusoidal voltages)	28 V <sub>pp</sub> (10 V <sub>RMS</sub> for sinusoidal voltages)
Standard integrated filters:		
1000 Hz filter . . . . .	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 4	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 4
Weighting filter to CCR 468 . . . . .	Attenuation at 1000 Hz: 0 dB $\pm$ 0.5 dB Characteristic: see curve 3	Attenuation at 1000 Hz: 0 dB $\pm$ 0.5 dB Characteristic: see curve 3
Weighting filter to DIN 45 405 and DIN 45 500 . . . . .	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 1	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 1
dB (A)-Weighting filter to DIN 45 500 . . . . .	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 2	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 2
Setting range of level potentiometer . . . . .	1 or 2 on plug-in board	0 dB to - 10 dB 1 on plug-in board
Optional plug-in filters . . . . .	- 10 $^{\circ}$ C to + 50 $^{\circ}$ C	- 10 $^{\circ}$ C to + 50 $^{\circ}$ C
Operating temperatures . . . . .	45 . . . 60 Hz 180 . . . 265 V	45 . . . 60 Hz 180 . . . 265 V
Power requirements . . . . .	for 220 V operation 90 . . . 130 V for 110 V-oper.	for 220 V operation 90 . . . 130 V for 110 V-oper.
Dimensions . . . . .	294 x 195 x 156 mm	294 x 195 x 156 mm
Weight . . . . .	appx. 6 kg	appx. 6 kg

An accessory transformer, RVZ 11-1, is available to convert the input for measurements in balanced audio circuits.



Transformer RVZ 11-1

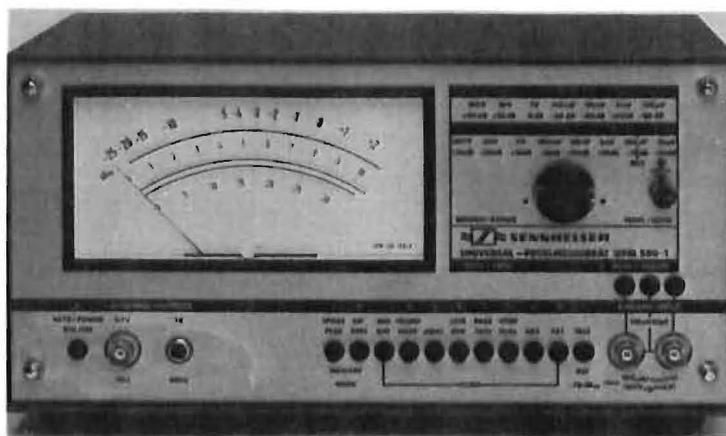
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## Sennheiser UPM-550-1 Universal Level Meter



**General Description:** The name of Sennheiser probably is associated by most of us with microphones and headphones, although this company also makes several specialized electronic devices for commercial applications. Its new UPM 550-1 is a professional-grade precision meter whose basic function is to measure AC voltages in the frequency range from 10 Hz to 1 MHz, but this "definition" hardly describes the instrument's enormous versatility.

Actually there are two versions—the UPM 550, and the UPM 50 550-1. The latter, which offers a few additional features, is the one chosen for this report. The basic UPM 550 can be used for making measurements of:

- standard frequency response and attenuation with true RMS or peak rectification;
- signal-to-noise ratios, weighted in accordance with DIN 45405 (for studio equipment);
- signal-to-noise ratios weighted in accordance with DIN 45500 (for hi-fi equipment);
- unweighted S/N ratios in accordance with either of the above standards;
- harmonic distortion of tape recorders (the 3rd-order component above 333 Hz);
- Cross-talk and erase ratios for tape equipment (using a built-in 1 kHz filter) in accordance with DIN 45511;
- various parameters using external filters as required;
- selective voltages of very small magnitude, from about 2 microvolts and up, using the built-in 1 kHz filter;

- sound-levels in accordance with DIN 45633 using an external calibrated microphone.

The UPM 550-1, in addition to the above, also can make direct measurements of harmonic distortion of a 1-kHz signal using its built-in 1-kHz notch filter. This version of the meter also contains an added input; input selector switching; level adjustment and associated defeat switch; and the 1-kHz filter control selector in the row of filter switches on the panel.

A large portion of the front panel is given over to the metering, a multi-purpose display with several scales calibrated in mV, dBV and dBm. The range selector switch and associated reference level indicators occupy the space to the right of the meter. There are LEDs for all range positions. To the right of this area (on the UPM 550-1) is the combination switch and level adjustment for the direct harmonic distortion measurement. Just below and to the right is the related input selector, and below it are the input connectors.

The instrument's power off/on switch is at the lower left; next to it are two outputs—one being rated for 60 ohms, 1 volt; the other for 600 ohms, 1 volt. The mode and filter switches form a row across the bottom of the panel. Included here are switches for both reserve and external filters which may be added as required.

The rear of the unit contains an external filter input and an associated calibration adjustment. A graph of the instrument's filter characteristics is printed here. The unit's power cord is detachable and plugs into a three-prong receptacle on the rear panel. The front may be fitted with handles.

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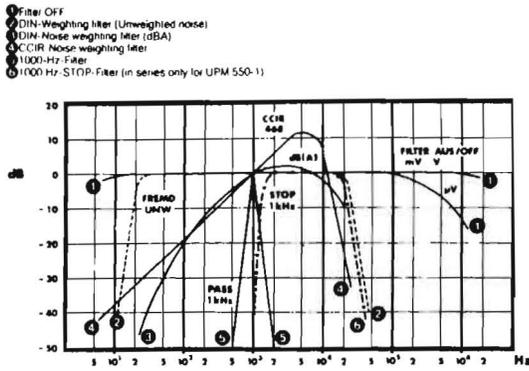


Fig. 1: Sennheiser UPM-550-1: Filter characteristics of the UPM-550-1 and 550 UPM as published by Sennheiser.

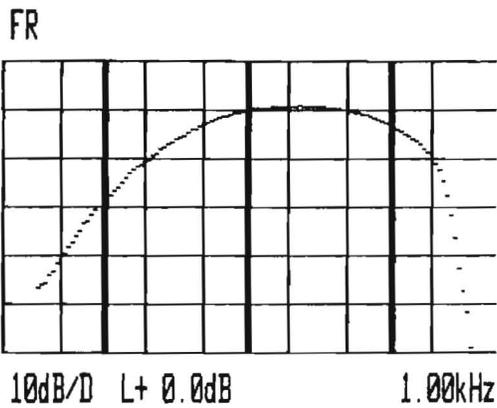


Fig. 2: Sennheiser UPM-550-1: A-weighting response curve as measured in the lab for the UPM-550-1. Compare this curve with the #3 curve in Fig. 1.

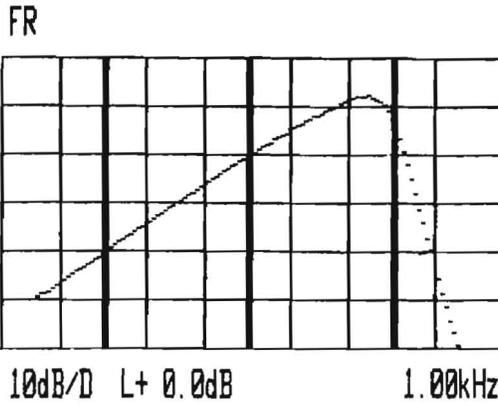


Fig. 3: Sennheiser UPM-550-1: Measured CCIR-468 curve for the unit. Compare this curve with the #4 curve of Fig. 1.

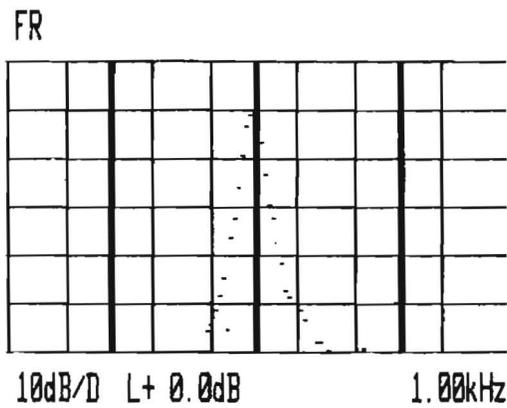


Fig. 4: Sennheiser UPM-550-1: Measured 1 kHz band-pass filter response for the unit. Compare this curve with the #5 curve of Fig. 1.

**Test Results:** Because of the nature of the UPM 550-1 we had to depart somewhat from our usual "Vital Statistics" presentation. We felt that it would make no sense to try to measure the accuracy of a meter with another meter of approximately the same degree of accuracy. So instead we are simply reprinting Sennheiser's specifications for both versions of the meter, and those who are interested in the wealth of data provided in these specs are invited to read them carefully.

About all we could do to check out the system was to use it for a while, and to plot some of the weighting filter curves and compare them with the published curves reproduced in Fig. 1 from Sennheiser's owner's manual.

Thus, Fig. 2 shows the familiar response curve obtained when we switched in the "A" weighting noise

filter. It compares quite neatly with the curve identified as "3" in Fig. 1.

Next we selected CCIR-468 weighting (this is the original CCIR-ARM version espoused by Dolby Labs). We show this in our Fig. 3, and it compares very closely with the Sennheiser curve labeled "4" in Fig. 1.

Finally we checked out the 1-kHz band-pass filter. The response when using that filter is plotted in our Fig. 4, and it is the same as the curve "5" shown in Fig. 1.

**General Info:** Dimensions are approximately 11.6 inches wide; 7.7 inches high; 6.14 inches deep. Weight is approximately 13 lbs, 4 oz. Price: UPM 550, \$1380; UPM 550-1, \$1680.

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**Joint Comment by N.E. and L.F.:** Any recording studio, or lab involved in audio design or testing, often must make precise measurements of signal levels. However, not all meters read voltages in the same way. There are average-reading meters, peak-reading meters, quasi-peak reading meters, true RMS meters and meters with varying rise and decay time constants. The truly well equipped studio or lab that wanted to keep up with the many ballistic characteristics of meters and the various methods of meter construction would have to own at least six different AC voltmeters, and possibly more. Add in the various and sundry "weighting curves" that often are associated with such signal-level readings, and the inventory of required gear increases even further.

With the Sennheiser instrument, it all comes together in one unit which, as far as we could determine, is both accurate (our own filter curves are in excellent agreement with Sennheiser's), and "idiot proof"—thanks to the front panel indicators that tell

you what range or scale on the meter is being used, what filters you have selected for a particular reading and whether peak or RMS readings are being made. The owner's manual is written in three languages (German, French and English). While some of the translation to English is a bit awkward in style, it is perfectly understandable and usable. The presentation is hardly on what could be described as an "elementary" level since it does presume previous knowledge and experience in making audio measurements. The device, in other words, is not intended for the casual or even enthusiastic "audiophile." However, for the professional user who is tired of having to plug in an assortment of different meters to check out equipment or to conduct proof-of-performance tests, the Sennheiser device may well be the one unit to replace several outdated or outmoded meters. Anyone who is planning to buy a group of new meters for a studio or lab would do well to consider this single device which may well be the only meter you require.

**SENNHEISER UPM 550 and 550-1 UNIVERSAL LEVEL METER: Vital Statistics**

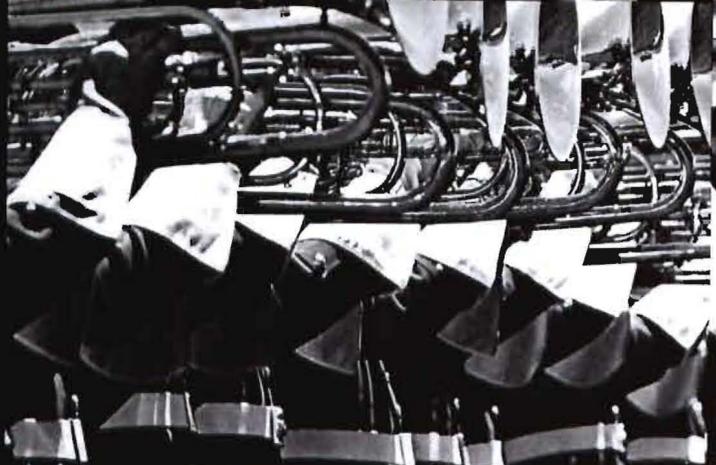
PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	
	UPM 550	UPM 550-1
<b>Voltage ranges</b>	0 30/100/300 $\mu$ V 1/3/10/30/100/300 mV 1/3/10/30/100/300 V -100 ... +52 dBV (selective -115 ... +50 dBV dBm) -98 ... +52.5 dBm (selective -113 ... +52.5 dBm)	0 30/100/300 $\mu$ V 1/3/10/30/100/300 mV 1/3/10/30/100/300 V -92 ... +52.6 dBm (selective -113 ... +52.6 dBm)
<b>Frequency range for peak rectification</b>		
Ranges 1 mV to 100V	10 Hz ... 1 MHz	10 Hz ... 1 MHz
Ranges 30 $\mu$ V to 300V	10 Hz ... 100 kHz	10 Hz ... 100 kHz
For RMS-rectification in all ranges	10 Hz ... 100 kHz	10 Hz ... 100 kHz
<b>Tolerance for sinusoidal voltages and measurements without filters:</b>		
<b>Amplifier (mV and V-ranges)</b>	20 Hz ... 200 kHz $\pm$ 3% 10 Hz ... 20 Hz and 200 kHz ... MHz $\pm$ 5%	20 Hz ... 200 kHz $\pm$ 3% 10 Hz ... 20 Hz and 200 kHz ... 1 MHz $\pm$ 5%
<b>Amplifier (<math>\mu</math>V-ranges)</b>	20 Hz ... 50 kHz $\pm$ 3% 10 Hz ... 20 Hz and 50 kHz ... 100 kHz $\pm$ 5%	20 Hz ... 50 kHz $\pm$ 3% 10 Hz ... 20 Hz and 50 kHz ... 100 kHz $\pm$ 5%
<b>Input divider</b>	$\pm$ 0.5%	$\pm$ 0.5%
<b>Scale Linearity of rectifiers at RMS-rectification</b>	$\pm$ 0.5%	$\pm$ 0.5%
<b>Indicating Instrument</b>	tolerance class 1.0	tolerance class 1.0
<b>Scale Linearity of rectifiers at peak-rectification</b>	$\pm$ 0.5%	$\pm$ 0.5%
<b>at peak-rectification</b>	$\pm$ 3%	$\pm$ 3%
<b>Dynamic properties</b>		
for peak-rectification	according to DIN 45 405	according to DIN 45 405
for RMS-rectification	according to DIN 45 633 and 45 500	according to DIN 45 633 and 45 500

Frequency of built-in calibration generator	1000 Hz $\pm$ 1%	1000 Hz $\pm$ 1%
Voltage constancy	0.2 %/K, 0° bis +50° C	0.2 %/K, 0° bis +50° C
Input impedance	1 M $\Omega$ /50 pF	1 M $\Omega$ /50 pF
Max tolerable D.C.-voltage at the input	400 V	400 V
Max tolerable A.C.-voltage at the input:		
In the mV and V-ranges	500 V peak	500 V peak
in the $\mu$ V-ranges	10 VRMS	10 VRMS
Noise voltage referred to input:		
unterminated, screened input		
without filters	$\leq$ 15 $\mu$ V eff	$\leq$ 15 $\mu$ V eff
unterminated, screened input with		
1000 Hz filter	$\leq$ 2 $\mu$ V eff	$\leq$ 2 $\mu$ V eff
terminated with 10 k $\Omega$ without filters	$\leq$ 10 $\mu$ V eff	$\leq$ 10 $\mu$ V eff
with 1000 Hz filter	$\leq$ 1 $\mu$ V eff	$\leq$ 1 $\mu$ V eff
Outputs		
Monitor output	e.m.f. = 100 mV at t.s.d. R <sub>i</sub> = 60 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = 100 mV at t.s.d. R <sub>i</sub> = 600 $\Omega$ $\pm$ 3% (short circuit proof)
Headphone output	e.m.f. = 1 V at t.s.d. R <sub>i</sub> = 60 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = 1 V at t.s.d. R <sub>i</sub> = 600 $\Omega$ $\pm$ 3% (short circuit proof)
Filter output	e.m.f. = appx. 20 mV at t.s.d. R <sub>i</sub> = 600 $\Omega$ $\pm$ 3% (short circuit proof)	e.m.f. = appx. 20 mV at t.s.d. R <sub>i</sub> = 600 $\Omega$ $\pm$ 3% (short circuit proof)
Input impedance of the external filter input	600 $\Omega$ $\pm$ 20%	600 $\Omega$ $\pm$ 20%
Sensitivity of the external filter input	2.5 ... 12.5 mV adjustable on rear panel	2.5 ... 12.5 mV adjustable on rear panel
Max. e.m.f. of outputs		
Filter output	28 Vpp (10 VRMS for sinusoidal voltages)	28 Vpp (10 VRMS for sinusoidal voltages)
Monitor output	2.8 Vpp (1.0 VRMS for sinusoidal voltages)	2.8 Vpp (1.0 VRMS for sinusoidal voltages)
Headphone output	28 Vpp (10 VRMS for sinusoidal voltages)	28 Vpp (10 VRMS for sinusoidal voltages)
Standard integrated filters		
1000 Hz filter	Attenuation at 1000 Hz 0 dB $\pm$ 0.2 dB Characteristic: see curve 5	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 5
Weighting filter to CCIR 468	Attenuation at 1000 Hz 0 dB $\pm$ 0.5 dB Characteristic: see curve 4	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 4
Weighting filter to DIN 45 405 and DIN 45 500	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 2	Attenuation at 1000 Hz: 0 dB $\pm$ 0.2 dB Characteristic: see curve 2
dB (A)-Weighting filter to DIN 45 500	Attenuation at 1000 Hz 0 dB $\pm$ 0.2 dB Characteristic: see curve 3	Attenuation at 1000 Hz 0 dB $\pm$ 0.2 dB Characteristic: see curve 3
1000 Hz Stop filter		Attenuation at 1000 Hz > 66 dB Characteristic: see curve 6
Setting range of level potentiometer		0 dB to -10 dB
Optional plug-in filters	1 or 2 on plug-in board	One on plug-in board
Operating temperature	-10° C to +50° C	-10° C to +50° C
Power requirements	45 ... 60 Hz 180 ... 265 V for 220 V-operation  90 ... 130 V for 110 V-operation  appx 15 VA	45 ... 60 Hz 180 ... 265 V for 220 V-operation  90 ... 130 V for 110 V-operation  appx 15 VA

## SENNHEISER®

Sennheiser Electronic Corporation (N.Y.)  
10 West 37th Street  
New York, N.Y. 10018  
(212) 239-0190  
Manufacturing Plant:  
D-3002 Wedemärk, West Germany





**CAN ONE MICROPHONE  
CAPTURE IT ALL?**



Now, one modular microphone system lets you put your listeners right in the middle of the action with an omnidirectional head...

...conduct an on-the-spot, hidden-mike interview with a super cardioid head mounted to a telescopic boom...

## SENNHEISER'S OMNIDIREC SHOTGUN, SPOT, LAVALIER MULT

Capture it all. All the performance of a full-range collection of the most advanced electret microphones. In one Sennheiser system.

The Sennheiser Multimike Electret Microphone System. A modular microphone that brings you all the capabilities you'll ever need. When you need them.

Start with the powering module and the microphone heads you use most. Then add on as the demands of your work—and your budget—expand.

Or begin with it all. With the complete System, you'll have all the microphone capabilities required for every aspect of ENG, sports reporting, documentary making, and more. At only one third the cost of a similar collection of separates.

But more important, you'll enjoy a standard of quality and performance no comparable microphone—separate or modular—can provide. Because the Multimike System uses Sennheiser's unique back-electret technology. For extended frequency response and temperature range. Plus a reduction in weight over conventional electret microphones.

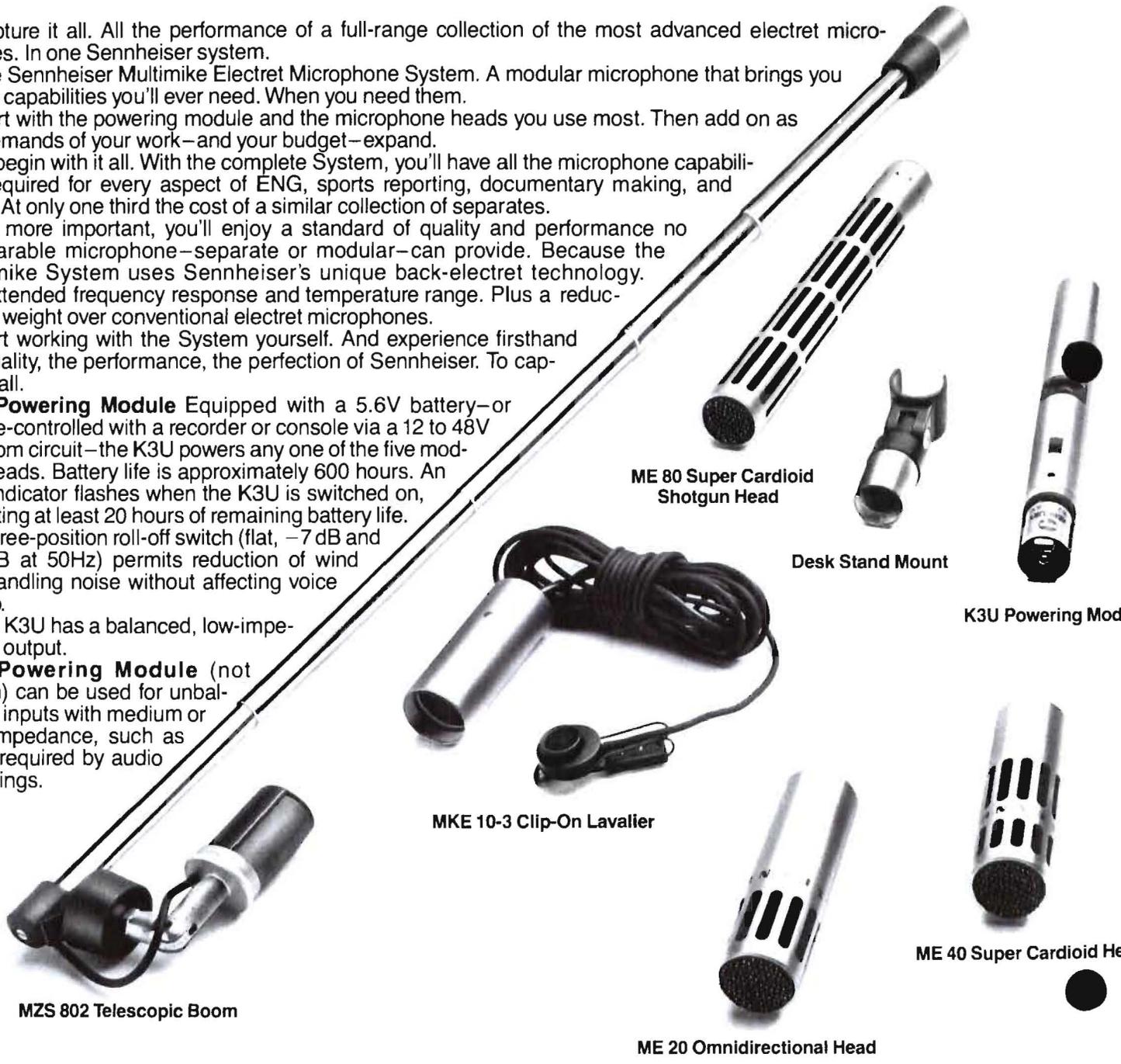
Start working with the System yourself. And experience firsthand the quality, the performance, the perfection of Sennheiser. To capture it all.

**K3U Powering Module** Equipped with a 5.6V battery—or remote-controlled with a recorder or console via a 12 to 48V phantom circuit—the K3U powers any one of the five modular heads. Battery life is approximately 600 hours. An LED indicator flashes when the K3U is switched on, indicating at least 20 hours of remaining battery life.

A three-position roll-off switch (flat, -7 dB and -20dB at 50Hz) permits reduction of wind and handling noise without affecting voice pickup.

The K3U has a balanced, low-impedance output.

**K1U Powering Module** (not shown) can be used for unbalanced inputs with medium or high impedance, such as those required by audio recordings.



ME 80 Super Cardioid Shotgun Head

Desk Stand Mount

K3U Powering Mod

MKE 10-3 Clip-On Lavalier

ME 40 Super Cardioid He

MZS 802 Telescopic Boom

ME 20 Omnidirectional Head



...record the band without the grandstand, using a super cardioid shotgun head...



...or zero in on the voice of a speaker from across a crowded auditorium with a sensitive spot head. All, just the beginning of the most versatile microphone ever.



# TIONAL, SUPER CARDIOID MIKE SYSTEM CAPTURES IT ALL.

**ME 20 Omnidirectional Head:** Preserves the entire acoustic ambiance. For interviews and meetings in quiet surroundings, or when pickup of background noise is essential. Internal acoustic isolation to minimize handling noise.

**ME 40 Super Cardioid Head:** Sharp attenuation of sound arriving from behind to eliminate ambient reverberations and feedback from loudspeakers. For interviews in noisy surroundings, film dubbing, PA... wide frequency response in musical applications.

**ME 80 Super Cardioid Shotgun Head:** Pressure gradient interference transducer for accurate, noise-free sound pickup at a distance, even in acoustically poor environments. Can also be used to solve extremely severe PA system feedback problems.

**ME 88 Spot Head:** The ultimate in clarity, even at long distances. A long interference tube transducer for an almost beam-like pickup pattern. Extremely light weight (2 oz.) to permit direct mounting on a handheld camera or attachment to the MZS 802 Telescopic Boom. Fixed wind-screen for imperviousness to wind and handling noise.

**MKE 10-3 Clip-On Lavalier:** Ultra-compact design, conspicuous only for its sound quality. Steel-reinforced cable and snap-proof clamp connection for unsurpassed ruggedness and safety. Ideal for newscasters, announcers, actors, panelists, etc.

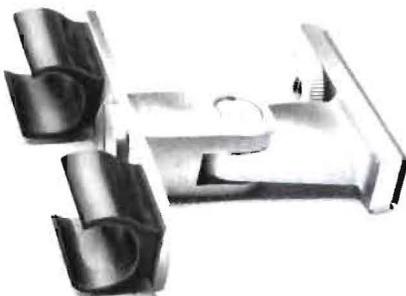
**MZG 802 Camera Mount:** Fits Multimike Electret Microphone System to almost any make of camera.

**MZS 802 Telescopic Boom:** Fits between powering module and microphone head to extend reach up to 27 inches, with three click-stopped mike positions. Cable-free double-rod design for improved reliability.

**MZK 802 Connection Cable:** Connects the powering module directly to a sound camera with compact coiled cable extending a full three feet. Steel-reinforced for durability and safety.



MZW 415 Windscreen for ME 80



MZG 802 Camera Mount



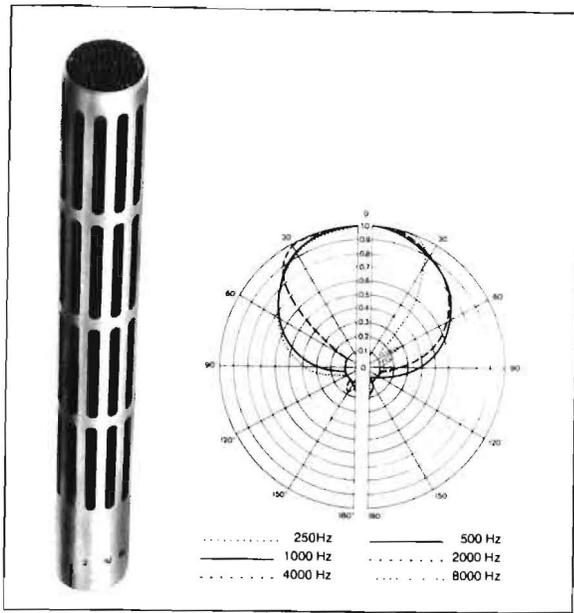
MZK 802 Connection Cable



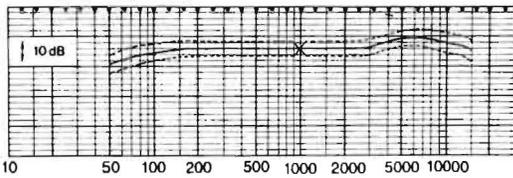
ME 88 Spot Head

# ACCESSORIES

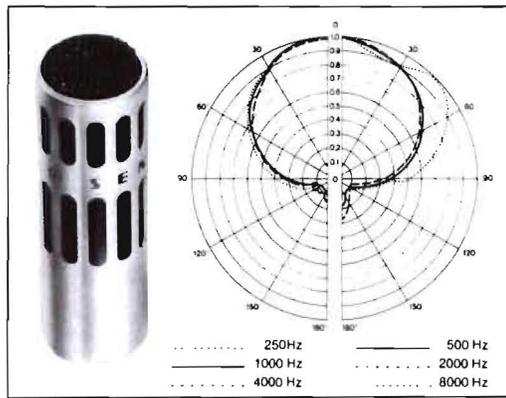
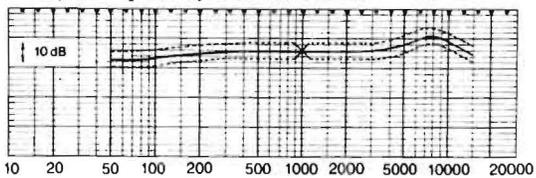
MZS 802 Telescopic Boom
MZG 802 Camera Mount
MZW 30 Windscreen for ME 20/ME 40
MZW 415 Windscreen for ME 80
MZK 802 Connection Cable
MZT 105-1 Desk Stand



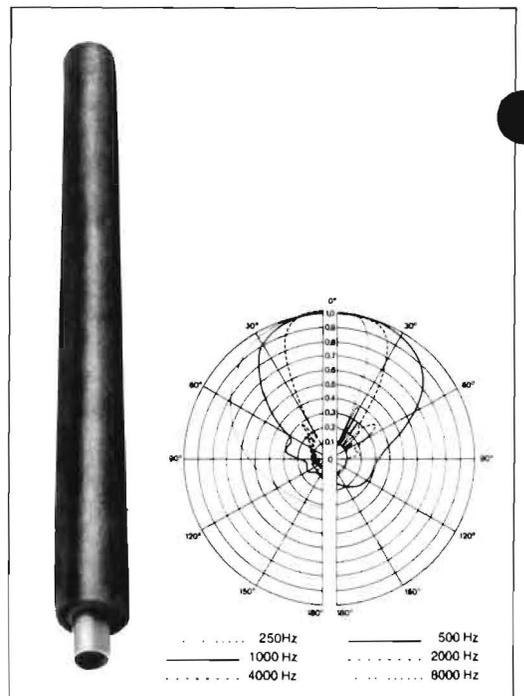
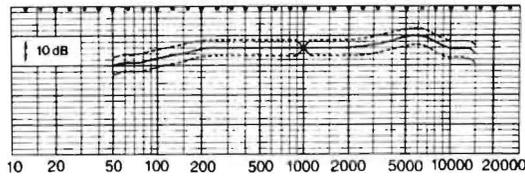
Frequency response: ME 20



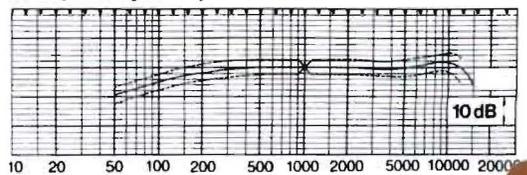
Frequency Response: ME 80



Frequency Response: ME 40



Frequency Response: ME 88



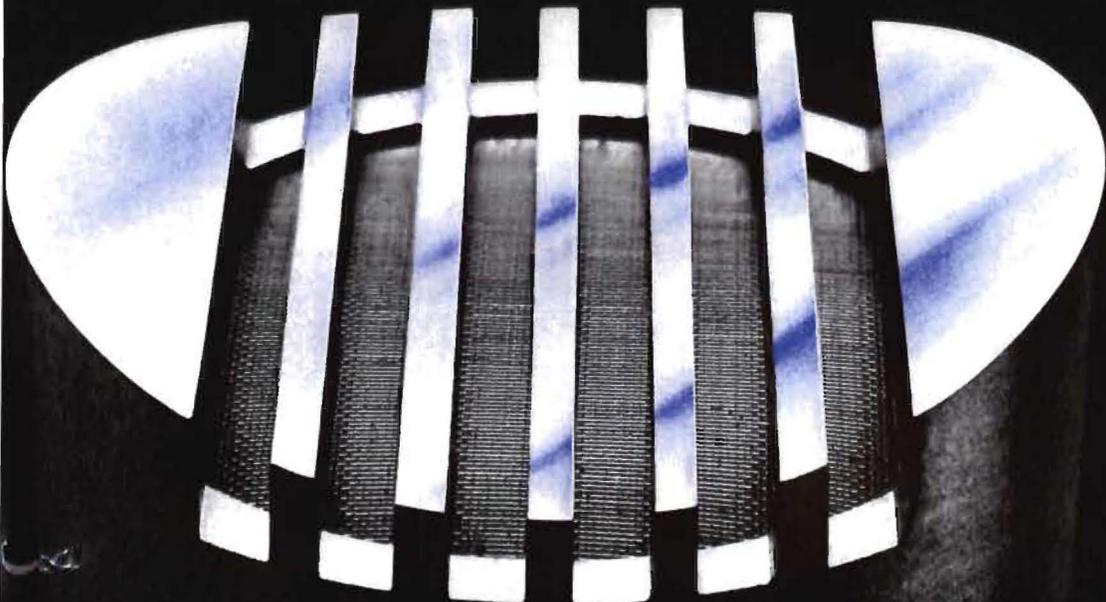
# TECHNICAL DATA

K 3 U with:	Frequency Response ± 4 dB	Open Circuit Output Level at 94 dB SPL	S/N Ratio
ME 20	50 Hz—16 kHz	48 dBm	64 dB
ME 40	80 Hz—16 kHz	48 dBm	64 dB
ME 80	40 Hz—15 kHz	44 dBm	70 dB
ME 88	40 Hz—16 kHz	44 dBm	70 dB
MKE 10-3	60 Hz—18 kHz	52 dBm	64 dB

Manufacturing Plant: Bissendorf/Hannover, West Germany  
© 1981, Sennheiser Electronic Corporation (N.Y.)

**SENNHEISER**  
ELECTRONIC CORPORATION  
10 West 37th Street, New York, N.Y. 10018  
(212) 239-0190

**FINALLY. CONDENSER MICROPHONES WITH  
STUDIO PERFORMANCE. AND FIELD DURABILITY.**



## SENNHEISER RF CONDENSER MICROPHONES.

**The Condenser Dilemma** Audio engineers have long known that condenser microphones provide the ultimate in wide frequency response, sensitivity and excellent transient response.

Until Sennheiser however, there have been certain practical drawbacks. Conventional condenser microphones are very sensitive to mechanical shock. Because of the high DC polarizing voltage, problems of high humidity or dielectric breakdown can frequently impair performance, especially at low frequencies (sometimes, even resulting in arc-over). Relatively bulky, cumbersome and inconvenient, they require outboard power supplies and impedance-matching transformers, or extremely short cables. Their generally larger diaphragms dictate larger housing dimensions. Moreover, the larger moving mass of conventional condenser diaphragms, is mechanically far more sensitive, requiring elaborate shock mounts.

Attempts to overcome these drawbacks have been only partially successful. While substituting FET transistors for vacuum tubes in conventional condenser designs has made the units more portable, the problems of critical amplifier input impedance and the likelihood of dielectric breakdown remains.

Electret microphones offer some advantages, by eliminating external DC bias. But the lower bias permanently "frozen" into the microphone capsule actually reduces the signal-to-noise ratio, impairing performance in critical applications.

The net result: while condenser microphones offer superior performance in high-quality recording and broadcast applications, their critical nature limits utility even in the studio. *And all but eliminates their ability to function in the field.* Until Sennheiser.

### The Sennheiser Solution: The RF Condenser Principle

At Sennheiser, we have virtually re-invented the condenser microphone, by making the capacitive transducer part of an RF bridge. Without need for DC bias or high impedance.

Because a small change in capacitance produces high output, the result is unparalleled sensitivity *and* high signal-to-noise ratio. Our RF capsule also tolerates high sound levels without overload, a quality especially apparent in our phantom-powered models.

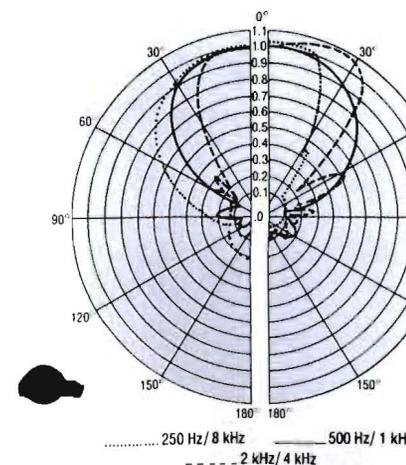
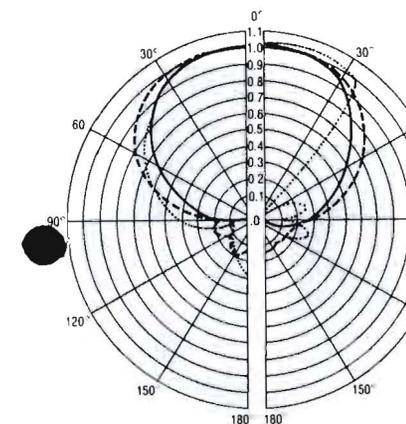
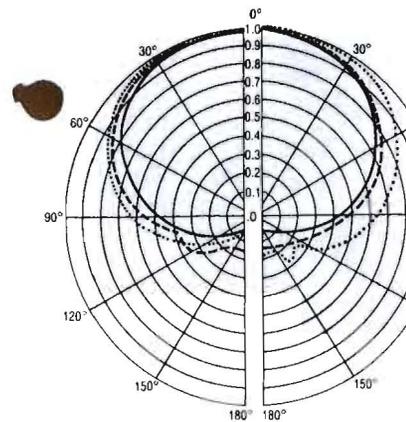
Sennheiser's transformerless, low-impedance FM design also provides other benefits. Including RFI protection at the capsule.

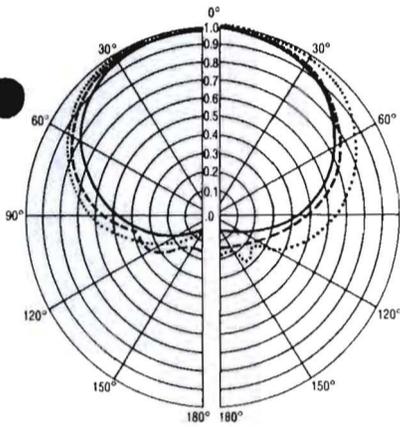
Immunity from hum pickup and interference by stray magnetic fields. Superior response with long cables. *And direct* connection to most equipment (bypassing transformer problems).

The inconvenience of complicated hook-up arrangements is also eliminated, with a choice of *three* powering systems: a compact, in-line battery supply or *two* external methods.

Sennheiser low-frequency response is exceptional. Operating on the same principle as data recorders, they are essentially capable of transducing frequencies of *less than 1 Hz* (!). While our scientific microphones function at these ultra-low frequencies, our Studio models must actually use ultra-low frequency *attenuation* to prevent overloading associated equipment.

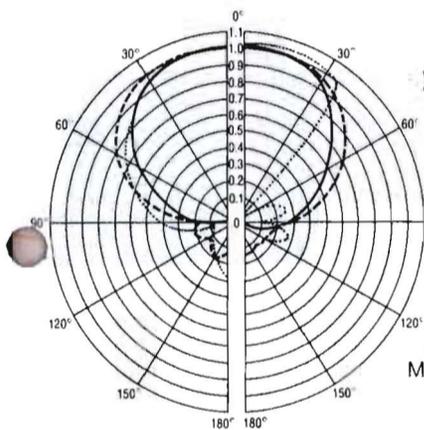
Besides an inherent ruggedness and ability to withstand mechanical shock, Sennheiser microphones also have better vibration immunity than ordinary condenser units: smaller, lower-mass capsules in compact housings of sophisticated design, minimize vibrational effects so that shock mounts are often not needed. Smaller size also improves acoustical properties, particularly directionality. Finally, with no DC bias, the capsule is completely immune to arc-over or performance problems due to reduction of capsule isolation resistance.





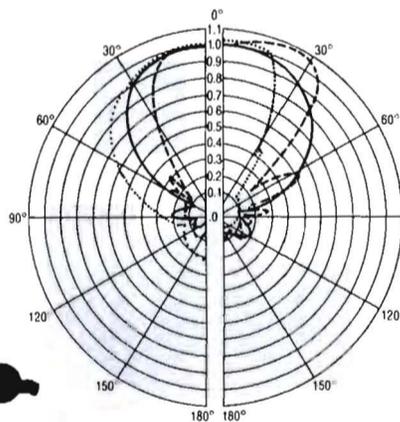
**MKH 406** Utilizing a pressure gradient transducer system with a cardioid pattern, this model provides precise directionality over the entire response curve. Its excellent audio characteristics make it ideal for studio applications requiring a directional unit. Its ruggedly engineered construction, ability to withstand severe climates and freedom from handling noises make it perfect for most field applications as well.

MKH 406 T-U for AB powering  
MKH 406 P 48-U for phantom powering



**MKH 416** Highly directional, this workhorse unit is a combination pressure gradient transducer and interference microphone. This gives it a cardioid pattern at low and medium frequencies, with a more directional club-shaped pattern at higher frequencies. The result is better isolation from wind and pop effects, as well as better immunity from breathing and clothing noises. Therefore, while it is basically a long-distance microphone designed to solve difficult problems, it is also highly favored by recording studios and performing soloists, as well as by reporters for those on-the-run sound gathering situations.

MKH 416 T-U for AB powering  
MKH 416 P 48-U for phantom powering



**MKH 816** The ultradirectional microphone with the narrow-beam pattern that picks out speakers at great distances. A combination pressure-gradient and interference system, similar to, but more directional than the MKH 416, makes it highly impervious to extraneous noise pickup, so it is perfect for the difficult environment of the crowded news conference, as well as the more controlled conditions of the movie set or TV stage.

MKH 816 T-U for AB powering  
MKH 816 P 48-U for phantom powering

..... 250 Hz / 8 kHz      ——— 500 Hz / 1 kHz  
- - - - - 2 kHz / 4 kHz

#### POWERING SYSTEMS

Sennheiser RF Condenser microphones can be popular powering systems in use today.

**Audio Wire (A-B) Powering**— invented by Sennheiser, this system (DIN standard # 45 595) is now used through the two audio leads, effectively isolating thus preventing interference voltages from being induced into the circuit. With Sennheiser microphones, it may be used in a number of convenient ways:

**Battery:** A battery adapter, MZA 15, is available in line with the cable, at a place along its length.

**AC Supply:** A convenient AC supply is available in line with the cable, at a place along its length.

**Direct Powering:** Power may be obtained directly from the microphone. Many professional instruments have provisions for this, notably the Sennheiser M 101 mixer, several recorder models, as well as the Arrivox and Stell recorders.

**Central Studio Supply:** Many studios are already providing low-voltage DC for microphone powering. Sennheiser RF Condenser microphones are compatible with these systems.

**Phantom Powering**— This system supplies DC power to the microphone by utilizing both audio leads as the positive and the cable shield as the negative leg. This system is compatible with unpowered, dynamic microphones. Of course, Sennheiser RF Condenser microphones are compatible with this system. The MZ 16 P 48 can be used in studios where phantom powering isn't available.



## MICROPHONES.

## THE THIRD GENERATION.

Audio engineers have long known that provide the ultimate in wide frequency tivity and excellent transient response. here have been certain practical draw- nser microphones are very sensitive to ause of the high DC polarizing voltage, or dielectric breakdown can frequently y at low frequencies (sometimes, even ively bulky, cumbersome and inconve- wner supplies and impedance-match- rely short cables. Their generally larger using dimensions. Moreover, the larger ndenser diaphragms, is mechanically ive, requiring elaborate shock mounts. se drawbacks have been only partially ing FET transistors for vacuum tubes in gns has made the units more portable, ier input impedance and the likelihood of dielectric breakdown remains.

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Sennheiser's transformerless, low-impedance FM design also provides other benefits. Including RFI protection at the capsule. Immunity from hum pickup and interference by stray magnetic fields. Superior response with long cables. *And direct* connection to most equipment (bypassing transformer problems).

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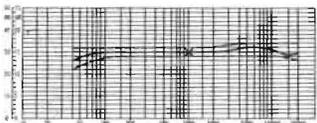
## THE THIRD GE



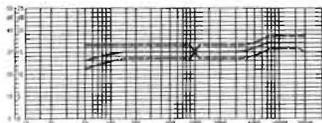
## SPECIFICATIONS

	MKH 406 T-U	MKH 406 P 48-U	MKH 416 T-U	MKH 416 P 48-U	MKH 816 T-U	MKH 816 P 48-U
Frequency response	40 ... 20,000 Hz					
Directional characteristic	cardioid	cardioid	super-cardioid/ club	super-cardioid/ club	club	club
Open circuit output voltage at 1000 Hz and 94 dB SPL	20 mV	20 mV	20 mV	25 mV	40 mV	40 mV
Source impedance at 1000 Hz	2 ohms, balanced	10 ohms, balanced	2 ohms, balanced	10 ohms, balanced	2 ohms, balanced	10 ohms, balanced
Minimum recommended load impedance	600 ohms (200 ohms up to 120 dB SPL)	1 K ohms (200 ohms up to 123 dB SPL)	400 ohms (200 ohms up to 120 dB SPL)	400 ohms (200 ohms up to 124 dB SPL)	400 ohms (200 ohms up to 114 dB SPL)	600 ohms (200 ohms up to 117 dB SPL)
A weighted S/N ratio at 24 dB SPL (IEC 179)	76 dB	76 dB	76 dB	77 dB	76 dB	75 dB
Volume handling capability	124 dB SPL	131 dB SPL	124 dB SPL	128 dB SPL	118 dB SPL	124 dB SPL
Supply voltage	12 V ± 2 V	48 V ± 12 V	12 V ± 2 V	48 V ± 12 V	12 V ± 2 V	48 V ± 12 V
Current drawn	6 mA	2 mA	6 mA	2 mA	6 mA	2 mA
Temperature range	-10°C to +70°C					
Output connector	3-pin XLR					
Dimensions in mm	3/4" dia., x 6.5" lg.	3/4" dia., x 6.5" lg.	3/4" dia., x 10" lg.	3/4" dia., x 10" lg.	3/4" dia., x 22" lg.	3/4" dia., x 22" lg.
Weight	5.3 oz.	5.3 oz.	6 oz.	6 oz.	13 oz.	13 oz.

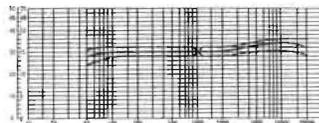
We reserve the right to alter specifications, in particular with regard to technical improvements.



MKH 406



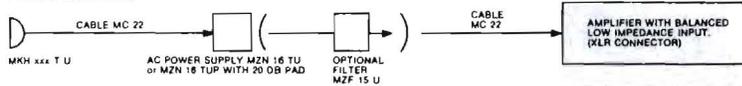
MKH 416



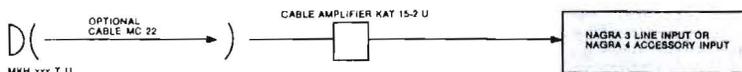
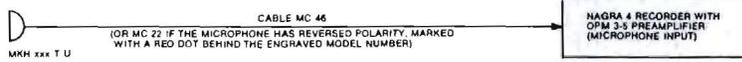
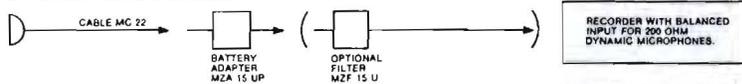
MKH 816

### INTERCONNECTION DIAGRAMS FOR MKH CONDENSER MICROPHONES

#### 1 STUDIO INSTALLATION



#### 2 CONNECTION TO PORTABLE RECORDERS



# SENNHEISER

ELECTRONIC CORPORATION  
10 West 37th Street, New York 10018 (212) 239-0190

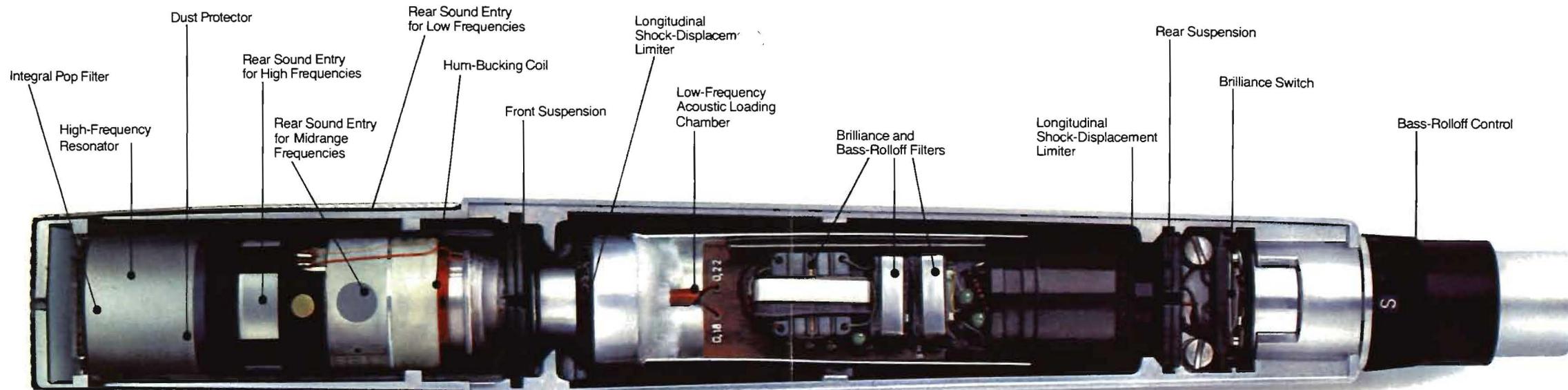
Manufacturing Plant: Bissendorf, Hannover, West Germany  
Printed in West Germany

# SENNHEISER

## MD 441

SUPERCARDIOID  
DYNAMIC MICROPHONE  
Studio Accuracy.  
Onstage Ruggedness.  
Superb Performance with  
Vocals and Instrumentals.





## MD 441: A DYNAMIC MICROPHONE WITH 'CONDENSER' PERFORMANCE!

Our design goal was ambitious: a microphone that could offer studio-quality sound in a wide variety of applications and environments. In short, a microphone to please performers and engineers alike.

The result: The MD 441. Without a doubt, the best dynamic microphone Sennheiser has ever made. So good, it actually outperforms many condenser microphones on the market today. With remarkably smooth, wide frequency response extending from 40 to 20,000 Hz. Tight, frequency-independent supercardioid pattern. Extremely low sensitivity to handling noise. Plus the kind of durability that's absolutely essential in day-to-day professional use.

As a result the MD 441 has rapidly become the studio-standard dynamic microphone for applications ranging from instrumental to vocal to speech—wherever reproduction of the highest quality is demanded.

### STUDIO QUIET IN THE PERFORMER'S HAND.

Supercardioid directionality has always been an extremely desirable microphone characteristic for performers. But supercardioid microphones traditionally have another characteris-

tic that is extremely undesirable: mechanical noise so severe, many can't even be hand held.

In the MD 441, the problem of mechanical noise has been solved with a double housing. The inner housing, containing the microphone element, is isolated from the outer housing by means of a highly compliant, damped spring suspension that shields it from mechanically-conducted noise. Allowing a most unusual metamorphosis: from a superb instrumental microphone to a hand-held, live-performance vocal microphone.

For optimum close mic'ing, the MD 441 also features an integral grille/windscreen and internal pop filter. Together, these control breath blasts and wind noise in almost any application. Bringing studio quiet—and accuracy—into the performer's hand.

### DEPTH, PRESENCE... AND ABSENCE.

To make the MD 441 even more practical and flexible, we added two more features that combine to create a unique switchable equalization network. A brilliance switch offers a 5 dB boost at 5 kHz, without affecting overall level. And a second, independent

equalizer switch makes possible a five-step attenuation of bass to selectively enhance vocals and instrumentals, while preventing over-emphasis of low frequencies.

There's also something you won't hear with the MD 441: In tests subjecting the MD 441 to sound pressure levels greatly exceeding the human pain threshold, there was an absolute absence of microphone clipping. Even in conditions so extreme, the preamplifier overloaded. So you can feel secure in placing it close to the hottest horn... or "feeding" it to the most explosive vocalist!

### THE PROFESSIONAL'S PROFESSIONAL MICROPHONE.

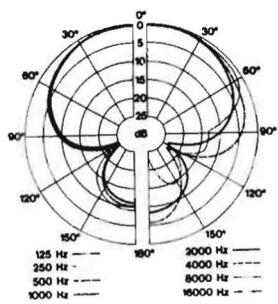
The MD 441 is designed for a wide variety of professional applications, including live performances, sound reinforcement, recording studios, film and broadcasting. Human-engineered with satin-chrome finish and non-slip, leatherlike grip surfaces—and acoustically engineered for superb technical performance—the MD 441 is a precision instrument that will delight any professional. Performers and engineers alike.



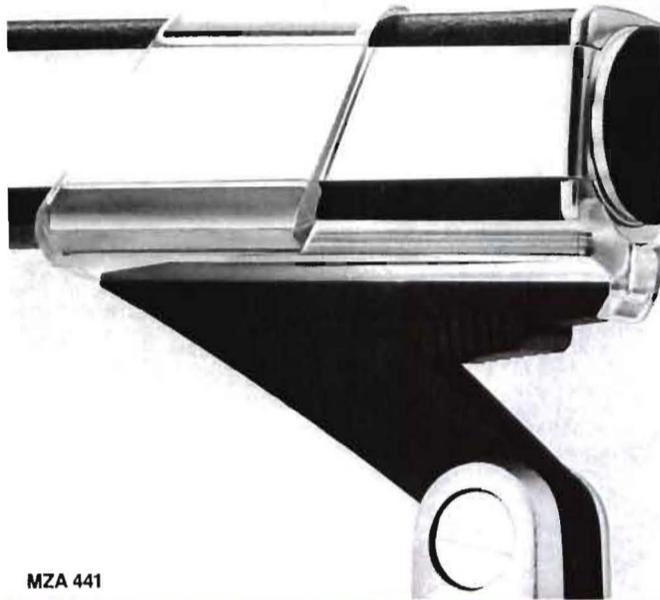
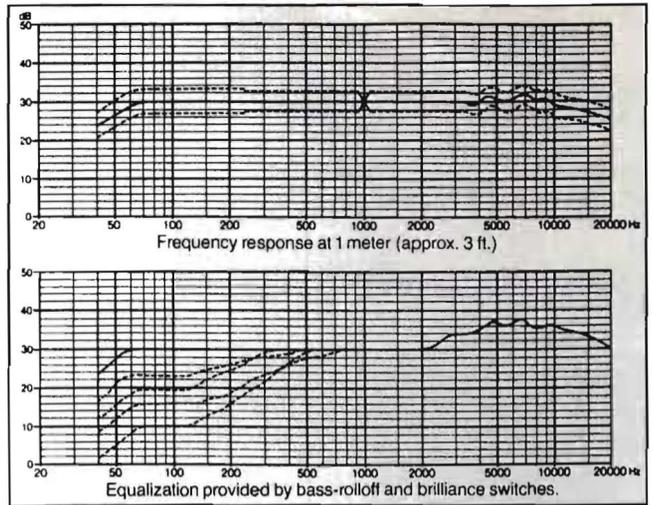
### SPECIFICATIONS

Frequency Response	40-20,000 Hz
Acoustic Mode of Operation	pressure gradient
Directional Characteristic	supercardioid
Sensitivity (1 kHz)	2mV/Pa* (-53 dBm), ± 3 dB
Impedance (1 kHz)	200 ohms
Brilliance Switch	5 dB boost nominal @ 5 kHz
Bass-Rolloff Switch	variable, five-position attenuation
Connector Connections	XLFR-type 1-ground; 2,3-signal
Sensitivity to Magnetic Fields	≤ 5 μV/mG
Dimensions	33 x 36 x 270mm (approx. 1 3/8" x 1 1/2" x 10 3/4" L)
Weight	450 g (approx. 12 oz.)

\*1 Pa (pascal) =  
10 μb (microbar) = 10 dyne/cm<sup>2</sup> = 94 dB SPL



Each MD 441 is delivered with an individual frequency response curve.



MZA 441

**INCLUDED ACCESSORIES**

**MZA 441 Stand Adapter and Quick Release Clamp**

A button-activated mechanical latch to lock microphone in place. Standard  $\frac{5}{8}$ " thread.

**MC 24 Cable**

Fifteen-foot shielded cable with XLR-type female connector on one end and pigtailed on the other. (not shown)

**OPTIONAL ACCESSORIES**

**Windscreens MZW 441**

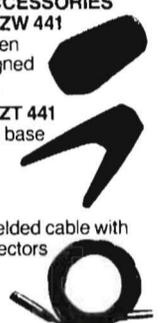
Foam windscreens especially designed for the MD 441.

**Table Stand MZT 441**

Heavy, die-cast base accepts the MZA 441.

**MC 22 Cable**

Fifteen-foot shielded cable with XLR-type connectors at both ends.



**SENNHEISER**

Sennheiser Electronic Corporation (N.Y.)  
10 West 37th Street  
New York, NY 10018  
(212) 239-0190  
Manufacturing Plant:  
Bissendorf/Hannover, West Germany

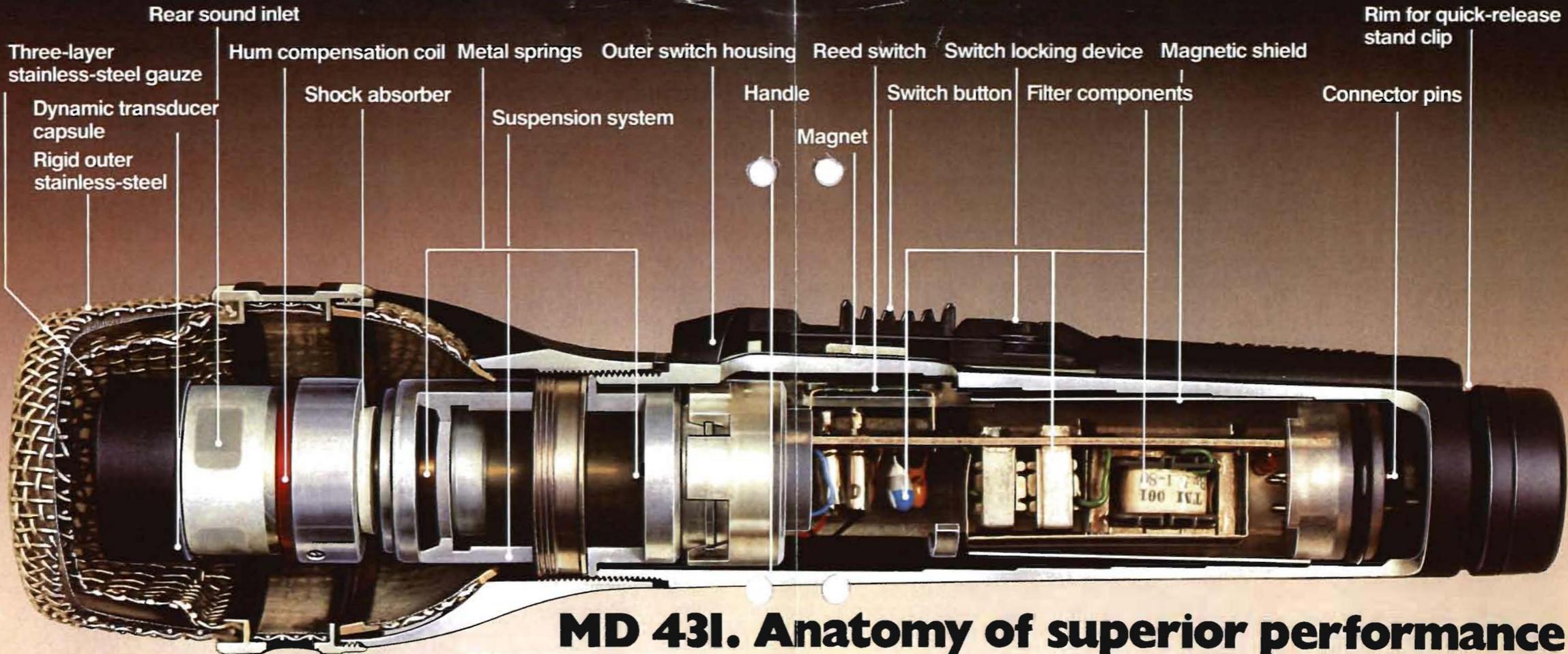
Available from:

**SENNHEISER**

**MD 431**

THE PERFORMER'S EDGE





# MD 431. Anatomy of superior performance

Today's performers don't have it easy. Under the most extreme conditions, in acoustics far from ideal, they're expected to combine recording-studio sound with all the spontaneity of a live performance. It's a difficult problem indeed. And one we at Sennheiser have been working to solve for quite some time. After considerable research and in-use testing, we've created a microphone designed to help performers sound their best. By giving them more usable power, even in the most difficult of circumstances. We call it the MD 431. And it's designed to provide superior performance from the inside out.

**Superior directionality. For greater versatility.**

One of the most difficult problems musicians face is unwanted sound pickup from the sides and rear – especially from musical instruments and loudspeakers. As a result, performers must often restrict their movements, instruments must be specially positioned and amplifiers must frequently be turned down.

It's the familiar feedback problem. And one that even conventional cardioid directional microphones cannot cure – because they still pick up 25% of their sound from the sides (as compared with on-axis sound from the front), which results in unacceptable stray pickup. To eliminate feedback, our MD 431 incorporates a special super-cardioid directional characteristic, reducing side pickup to a mere 12% (less than half that of conventional cardioids) – with even less pickup from the rear of the microphone. And because this directional pattern is virtually identical at all frequencies – unlike many other directional microphones – it provides an almost unbelievable freedom from feedback that must be heard to be believed. Resulting in dramatically-increased usable volume, for far greater audience impact.

**Mechanical noise suppression: insensitivity where it counts.**

Another problem – particularly with powerful sound reinforcement systems – is mechanical (handling) noise. Aside from disturbing the audience, it can actually damage equipment.

The answer: our MD 431. For several reasons. As you can see in the cutaway drawing above, the MD 431 is actually a microphone within a microphone. The dynamic transducer element is mounted within an inner capsule, isolated from the outer housing by means of a special shock absorber. This protects it from handling noise as well as other mechanical vibrations normally encountered in live performances.

To screen out noise still further, the MD 431 also boasts an internal electrical filter network to insure that low-frequency disturbances will not affect the audio signal. And even before sound reaches the diaphragm, a built-in mesh filter reduces the popping and excessive sibilance often produced by close-miking.

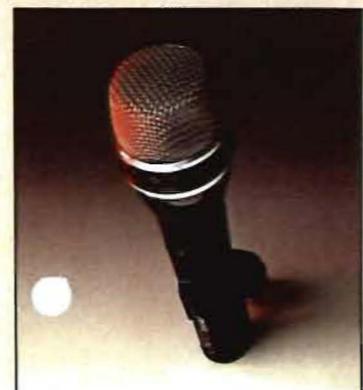
As a result, musicians finally have at their disposal a microphone combining smooth, wide-range response (especially in the lower octaves) with outstanding freedom from mechanical noise, for optimum performance in the most difficult applications.

**Additional features and benefits.**

By now, it should come as no surprise that the MD 431 also offers additional features to meet the demands of today's demanding professional environment. As the cutaway shows, the microphone is

extremely rugged, from the heavy-duty cast outer housing and stiff, interchangeable stainless-steel front grille to its precision space-capsule-like construction. This thoughtfulness and attention to performance are also reflected in such other details as

the lockable noise-free, hermetically-sealed reed-contact switch and lockable quick-release stand mount. But the best indication of how well the MD 431 performs are its specification. And a demonstration at your Sennheiser dealer's.



Technical Data	MD 431
Frequency response	40 to 16,000 Hz
Acoustical mode of operation	pressure gradient
Directional characteristic	super cardioid
Directionality (rejection at 1,000 Hz)	24 dB (-3 dB) at 120°
Open-circuit output voltage at 1,000 Hz	1.4 mV/Pa ± 3 dB
Electrical impedance at 1,000 Hz	200 Ω
Minimum load impedance	1,000 Ω
Switch	hermetically-sealed reed contact switch activated by moving magnet – activating assembly removable without affecting microphone functions
Filter	built-in rumble filter
Connector	XLR
Wiring	2 and 3 → moving coil 1 and case → ground
Magnetic interference	≤ 5 μV/5 μT test
Dimensions	handle: 31 mm max. dia., head: 49 mm max. dia.
Weight	250 g

The MD 431 is supplied complete with a quick-release clip and a 5 m long cable – XLR connector on both ends for balanced microphone inputs.

# Top-microphones in our line



## MD 441\*

The universal microphone with studio quality for demanding soloists.

Frequency range: 30 to 20,000 Hz  
Directional pattern: super cardioid  
Impedance: approx. 200  $\Omega$   
Sensitivity: 2 mV/Pa

## MD 416\*

The soloist microphone for all vocalists and instrumentalists.

Frequency range: 50 to 15,000 Hz  
Directional pattern: cardioid  
Impedance: approx. 200  $\Omega$   
Sensitivity: 1.3 mV/Pa

## MD 421\*

The popular directional microphone used by professionals as well as discriminating audiophiles.

Frequency range: 30 to 17,000 Hz  
Directional pattern: cardioid  
Impedance: approx. 200  $\Omega$   
Sensitivity: 2 mV/Pa

\*U.S. models of all microphones equipped with XLR connector. MD 421 finish (U.S. version) is Professional Matte Black.

 **SENNHEISER**  
The name for perfect sound

Sennheiser Electronic Corporation (N.Y.)  
10 West 37th Street  
New York, New York 10018  
Phone: (212) 239-0190

Manufacturing Plant:  
3002 Wedemark 2/Hannover, West Germany

AVAILABLE FROM:

Printed in West Germany

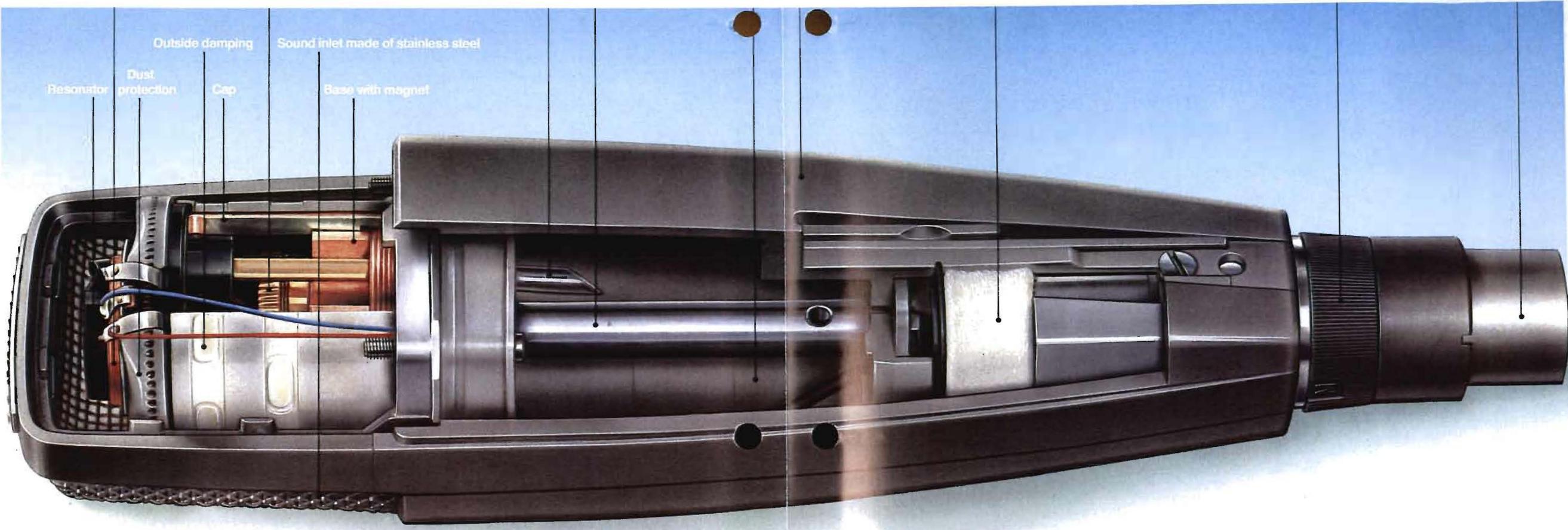
# SENNHEISER

● **Cardioid Dynamic Microphone**

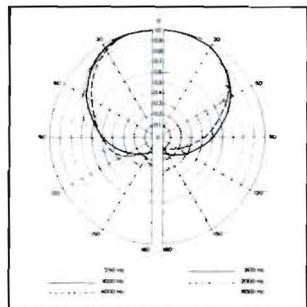
From a bang to a  
whisper - controlled response  
means superior reproduction.

## MD 421





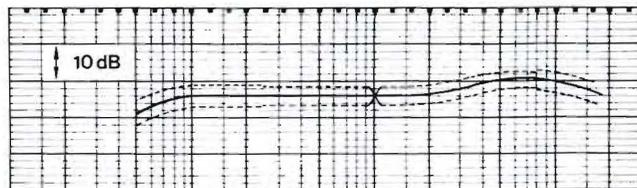
## MD 421: Superb Directionality and Freedom from Overload to more than 175 dB - from 30 to 17,000 Hz!



This is the microphone for today. Today's world of rock concerts at over 130 dB... studio recording sessions in close proximity to all types of instruments... disco

deejay applications... and location field recording - like jetports - with even higher levels. No other microphone is this immune to overload, yet so precise over such a wide range of frequencies.

Ruggedly constructed to precision standards, the MD 421 withstands hard use with Sennheiser's legendary reliability. Its pressure-gradient dynamic transducer provides faultless performance both in the protected confines of the studio, and in the often-hostile environment outdoors. Its controlled, wide-frequency response is de-



Standard Frequency Response with tolerance limits  
The original frequency response curve, measured from 40 to 17 000 Hz, is included with each microphone of this type.

signed with an intentional sensitivity increase in the upper range, for improved definition. And for low frequency control the MD 421 incorporates a five-step adjustable bass attenuator to tailor response for optimum performance under varying con-

ditions. Unique among dynamic microphones, the MD 421 is highly resistant to interference from stray magnetic fields. It provides the low handling-noise and freedom from feedback that all Sennheiser microphones are famous for.

### Model MD 421 U 4

A balanced, low impedance unit which may also be used with high impedance inputs with optional high impedance cable MC 57. It is equipped with a 5-step bass attenuator, XLR connector and stand adapter. Housing is high-impact, scratch-resistant ABS material with a black, non-glare finish.

#### Technical Data

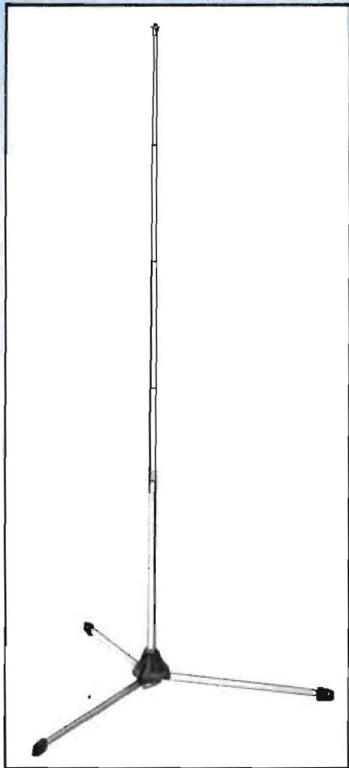
	MD 421 N (Art.-Nr. 0342)	MD 421-2 (Art.-Nr. 0331)	MD 421-U-4 (Art.-Nr. 0984)
Frequency response	30 .. 17 000 Hz	30 .. 17 000 Hz	30 .. 17 000 Hz
Acoustical mode of operation	pressure gradient transducer	pressure gradient transducer	pressure gradient transducer
Directional characteristic	cardioid	cardioid	cardioid
Rejection at 180° and 1000 Hz	18 dB - 2 dB	18 dB - 2 dB	- 54 dB ± 3 dB
Open circuit output level at 1000 Hz ref. 1 V/10 µbar	- 54 dB ± 3 dB	- 54 dB ± 3 dB	200 Ω
Impedance (1 kHz)	200 Ω	200 Ω	5 steps
Bass attenuator switch	5 steps	none	XLR-3
Output plug	T 3262 000	T 3081 006	switchcraft A 3 F
Cable connector	T 3261 001	T 3080 002	2 + 3: signal
Connections	1 + 3: signal	2 + case: ground	1 + case: ground
Insensitivity to magnetic fields at 50 Hz	± 5 µV/5 µ Tesla	± 5 µV/5 µ Tesla	± 5 µV/5 µ Tesla
Dimensions in mm	203 x 46 x 49	191 x 46 x 49	215 x 46 x 49
Weight	530 g	500 g	530 g

We reserve the right to alter specifications, in particular with regard to technical improvements.

# MD 421 Precision Accessories For perfection with convenience.

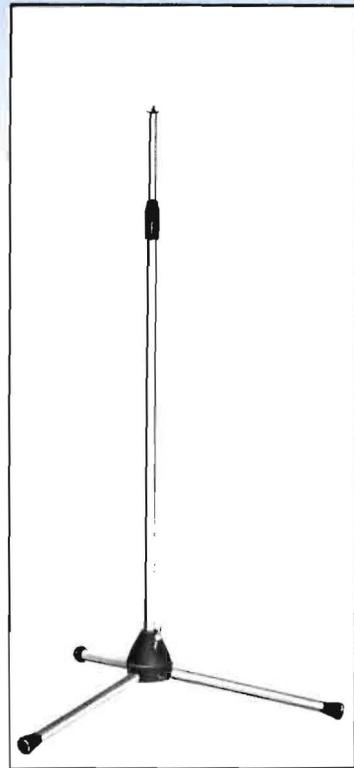
## MZS 142 Lightweight Floor Stand

Telescoping, collapsible unit with water-proof transit cover. Extends to 54" (138 cm), closes to 16" (41 cm).



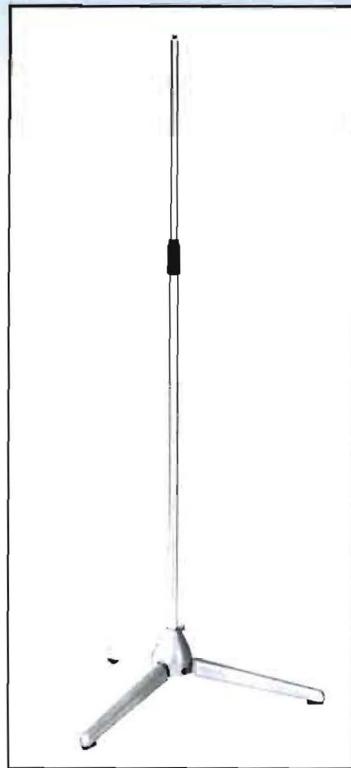
## MZS 144 Floor Stand

Adjustable between 33" (84 cm) and 62" (158 cm). Rubber-tipped legs are detachable.



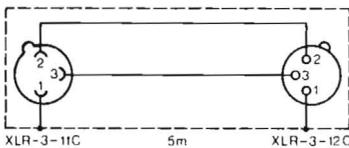
## MZS 210 DeLuxe Floor Stand

Heavy-duty unit with anti-vibration mounts concealed in legs. Adjustable between 33" (84 cm) and 62" (158 cm). Legs fold together for transit.



## MZS 211 Boom Arm

Fits stands 142, 144 and 210. Fully adjustable for length to a maximum of 33" (84 cm) and to all angles.



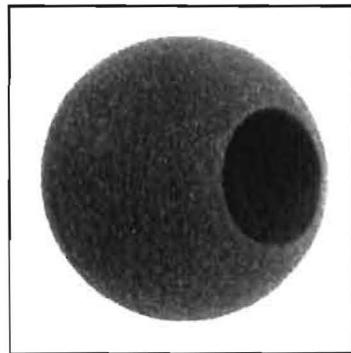
## MC 22 Cable

Heavy duty, neoprene coated, two-conductor shielded cable with standard XLR connector at both ends.



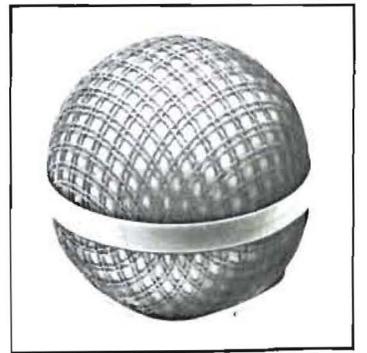
## MZT 421 Desk Stand

Heavy, diecast stand assures stability. Measures 5" x 4 1/2" x 1" (127 x 112 x 22 mm).



## MZW 421 Windscreen and Pop Filter

Flexible windscreen made from open-cell sponge. Measures 3" (80 mm) diameter.



## MZW 22 Windscreen and Pop Filter

Fiberglass-reinforced polyester for superior wind-noise reduction. Measures 3" (80 mm) diameter.

 **SENNHEISER**