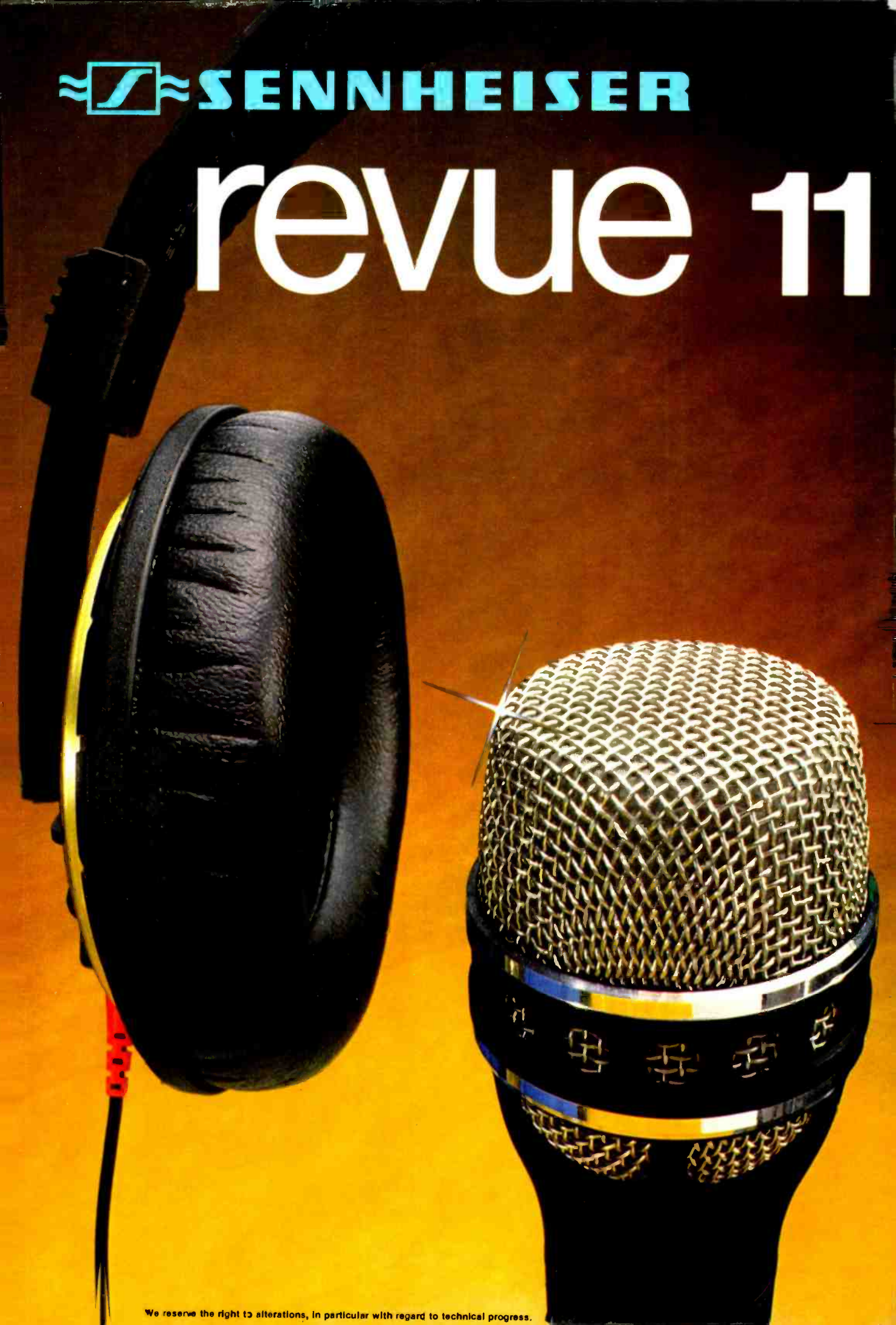
SENNHEISER

revue 11



We reserve the right to alterations, in particular with regard to technical progress.

Preface

Dear Sennheiser Friend,

This eleventh edition of our Micro-Revue brings you once again a comprehensive and updated summary of our product range. It has been necessary to expand upon previous issues by a number of pages, as our research, development and design departments have further improved many existing models and have also introduced a number of new and interesting products, including, for example, the new enclosed-type HD 230 Headphone and the portable infrared units, together with the dynamic microphones, electret capacitor microphones, high-frequency capacitor microphones, wireless transmission technology and all other areas of Sennheiser activities which reflect the latest results of our up-to-the-minute R & D work. Currently we employ approximately 1,000 people, which is a pretty creditable performance since the day in 1945 when Professor Sennheiser founded the firm with a mere dozen employees. Spending for the development of new products far exceeds the average for the electronics industry, which also accounts for the abundance of new concepts. This is another way in which Sennheiser safeguards its total economic independence both now and for the future. Today our Company remains under the sole ownership of Professor Sennheiser and Dr. J. Sennheiser. To satisfy the constantly rising demand for headphone equipment a second factory has been established to concentrate virtually exclusively on production for this product area. Here modern facilities have been set up for highly efficient series production with total quality control. We have compiled this Revue in the form of a book. Simply check down the list of contents on the opposite page and turn to the page indicated. If you have any additional questions we suggest that you contact your Sennheiser Agent, as listed on the last page of this Revue. We are also available to you here at Sennheiser at any time should you wish to contact us direct by telephone. We hope you will find this edition of the Sennheiser Revue both useful and informative.

Yours,
Sennheiser Electronics

SENNHEISER
The name for perfect sound

TABLE OF CONTENTS

A Primer for Microphone and Headphone Specifications

In the technical descriptions of our products you will be confronted with a number of technical terms. To enable you to locate the explanations for the terms we list them hereunder in alphabetical order.

Acoustical Coupling
There are basically two different methods of coupling sound from a headphone to the ear. A distinction is drawn between headphones which rest loosely against the ear (supraaural headphone) and those which enclose the outer ear completely (circumaural headphone).

Adaptation
The headphone and microphone must be suitable for the equipment to which they are to be connected. Sennheiser dynamic hedphones can be operated with remarkable ease from the appropriate headphone and loudspeaker output, as the load imposed on these outputs is extremely low (no-load operation) owing to the high electrical impedance of the headphones. An additional advantage is that there is no great variation in volume and signal to noise ratio on the changeover from loudspeaker to headphone operation.
Electrostatic headphones have a higher power consumption and must be connected to the loudspeaker output of the amplifier.
Normally microphones should be operated in no-load state, which means that the impedance of the amplifier input should be considerably greater than that of the microphone.

Asymmetrical Microphone Connection
With asymmetrical microphone connection only one core carries the audiofrequency voltage, whereas the cable screen is frequently used for feedback. This cable screen is connected to the zero potential of the following amplifier. However, usually also in asymmetrical connection the feedback is carried by a separate cable core. This offers the advantage of preventing equalising or compensating currents flowing through the screening from causing hum in the following amplifier, so that microphones connected in this manner can be operated symmetrically or asymmetrically depending on the amplifier input circuit.

Binaural Sound
The principle of "dummy head" or binaural stereophonics consists of reproducing as exactly as possible by way of headphones for the ears of the listener the sound impressions which have been recorded at the artificial ears of a dummy head. This will, of course, be achieved only to the extent that the dummy head displays the same acoustic characteristics as a natural head. For purposes of comparison take the head of a shop window dummy: here a perfect reproduction has been made of all those parts of the head of importance for the sound field. Even the softness of the material used for the outer ears has been adapted to the human counterpart. The internal auditory canal has also been reproduced. Previous attempts have made use of special condenser microphones in place of the eardrums to record the exact sound pressure pattern which is applied to the eardrum. A recent Sennheiser development, on the other hand, uses two high sensitivity condenser microphones to record the sound pressure at a clearly defined location at the entry to the auditory canal.
The recording obtained with these two condenser microphones is conveyed in the usual manner to a two-channel tape recorder or transmitted via a stereo radio transmitter or pressed in the grooves of a stereo disc. In this respect this particular technology fortunately does not differ in any way from conventional stereo. It therefore does not need four transmission channels but only two. On playback these two channels are simply fed to the two systems of a headphone.
The binaural stereo impression recorded in this manner conveys to the listener through the headphones the same audio impression which would be experienced by a human subject sitting in the position of the dummy head. This is simply because the listener's ears are receiving the sound in exactly the same manner as it had been delivered to the "eardrums" of the original dummy head.
Recordings made with a Sennheiser head stereo microphone pass through the acoustic path of ear inlet – auditory canal – eardrum only once, whereas recordings with the dummy head follow the same path twice.

Cardioid Characteristic
The directional characteristic of a directional microphone is frequently in the same configuration as a kidney. The maximum rejection is achieved at 180° and the directivity factor is approximately 3.

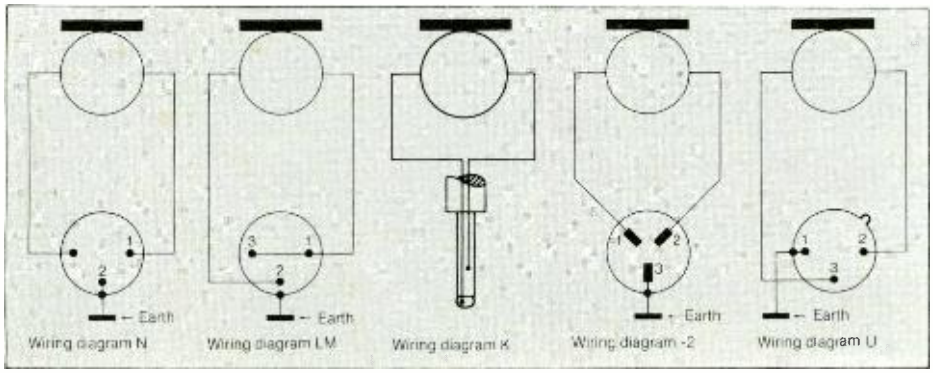
Close Talking Effect
This effect is attributable to physical causes and occurs with any pressure gradient receiver. With a pressure microphone the diaphragm is moved only by the air pressure fluctuations exerted upon it. By contrast with a pressure gradient receiver the difference in pressure between the front and back sides of the diaphragm causes the deflection or movement. As the pressure variation relates to the curvature of the wave fronts, when the voice is projected into gradient microphones from a short distance the pickup of low frequencies is relatively stronger than at larger distances. To compensate this effect adjustable bass regulators have been fitted in the MD 421 and MD 441.

dB Scale
Assessment of frequency responses, directional characteristics, signal to noise ratios, etc., always depends on the interrelationship of the measured value in question. In electroacoustics a logarithmic scale is used as a means of approximating the audio sensitivity of the measured values, for which the unit employed is the decibel (dB). Acording to definition a power ratio of 1 : 10 is equivalent to a value of 10 dB. This, in turn, means that a voltage ratio of 1 : 10 is the same as a power ratio of 1 : 100 and thus equivalent to 20 dB.

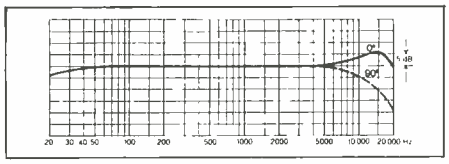
Directional Characteristics
In addition to the omnidirectional characteristic, which picks up the sound uniformly from all sides, there are a variety of additional directional characteristics. Before a microphone is purchased careful thought should be given to the intended use or the directional characteristic most suitable for your particular purpose. Directional microphones are usually employed to suppress unwanted room noise. This increases in direct proportion to the directivity factor of the microphones concerned.
The directional efficiency of microphones can be shown clearly by a directional chart. A distinction is drawn between the various directional characteristics described as "omnidirectional", "cardioid", "supercardioid", "hypercardioid" and "lobar". The directional chart is obtained by placing the microphone in an unobstructed sound field and subjecting it to a sound of constant frequency which is then revolved by 360° before the loudspeaker. The transmission factor relative to the angle of sound incidence is plotted on the visual chart paper which revolves synchronously. In accordance with standard specifications this recording is taken on a logarithmic scale. The maximum value at 0° is the reference level 0 dB. In order to depict the form of directional characteristic at varying frequencies separate recordings are taken for a few specific frequencies and depicted on a common graph sheet. To allow as many frequencies as possible to be depicted clearly, four different frequencies are indicated on both pages which naturally are continued in mirror image on the opposite page in each case. The illustration shows the directional chart for the MD 441.
The angle of greatest elimination is selected according to the intended microphone use. If, for example, the source of the noise interference is exclusively centred behind the microphone, a cardioid model with maximum suppression at 180° would be employed. The other characteristics are of equivalent importance with maximum suppression at 110° (hypercardioid), 120° (supercardioid).

Directivity Factor
The directivity factor is of significance for directional microphones. It indicates the relationship between the power output of a nondirectional microphone and that of a directional microphone of equal sensitivity in a diffuse sound field. For instance an ideal cardioid microphone has a directivity factor of 3.
As this involves a power ratio and sound intensity decreases as the square of the distance, for practical purposes this directivity factor indicates that a cardioid microphone can be used at a distance of $\sqrt{3} = 1.73$ times greater than in the case of a omnidirectional microphone. With the hypercardioid microphone it is possible to achieve a directivity factor of up to 4, whereas the directivity of shotgun-type microphones is much higher still.

Directivity Index
The directivity index indicates how much smaller is the sound pickup from a specific direction by comparison with the main direction of sound radiation. The value is stated in dB or decibels. If



the directivity index of the MD 441 at 130° and 1000 Hz is 20 dB, this means that a sound level from this angle at this frequency generates at the microphone a voltage which is 20 dB smaller than if it were to be irradiated from 0°.



Dynamic Headphone
All Sennheiser headphones with the prefix HD are of the dynamic type operating on the moving coil principle. An alternating current fed through the coil, which is located in an annular gap in a permanent magnet, generates movements of both the coil and the diaphragm which it carries which are equivalent to the alternating current at audio frequency.

Dynamic Microphone
All Sennheiser microphones with the prefix MD are dynamic microphones. This type of microphone incorporates a diaphragm within an annular magnetic field generated by a permanent magnet. As the sound waves strike the diaphragm they set both it and the interconnected moving coil into motion. Following the induction principle, electrical voltages are induced in the coil equivalent to the incident sound waves.

Electret Condenser Microphone
By contrast with other low frequency microphones, with the electret condenser microphone it is not necessary to apply any polarisation voltage to the capsule. The name "electret" is analogous to magnet. Similarly to the manner in which magnetism remains permanently intact in a hard magnetic material, it is possible with certain electrical materials to achieve a permanent electrical charge through a special polarisation process in the materials.

Electrical Impedance
(also known as source impedance)
This is important for correct amplifier matching. The terminal impedance, i. e. the input resistance or impedance of the connected amplifier, should always be considerably higher than the source impedance (voltage matching). For this type of matching it is sufficient to specify a rated electrical impedance. The true impedance, which is more or less frequency-dependent, can vary somewhat from this rated impedance.

Electroacoustic Transducer Principles
With microphones, several different electrical principles are used for transforming acoustical energy into electrical energy:
1. Piezo-resistive
   (carbon microphones)
2. Piezo-electric
   (ceramic and crystal microphones,
   Piezopolymer microphones)
3. Electromagnetic
   (magnetic microphones for deaf aids)
4. Electrodynamic
   (dynamic microphones, ribbon microphones,
   planardynamic microphones)
5. Electrostatic
   (capacitor microphones, electret microphones)

All transducer principles have their own range of application in general. For example, the relatively simple carbon microphone is still used today in telephones. By contrast condenser microphones are employed where maximum possible audio fidelity is required. Sennheiser concentrates particularly on the production of dynamic and electrostatic microphones.

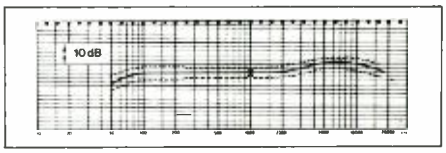
Electrostatic Headphones
Electrostatic headphones operate on the principle of attracting electrical charges. The extremely lightweight diaphragm permits maximum audio fidelity. The highly transformed audio frequency voltage is used to drive the diaphragms. Sennheiser electrostatic headphones need no external dc voltage source as they incorporate electret diaphragms.

Equivalent Noise
If you bring a microphone into a totally quiet room and also connect it up to an extremely high-quality amplifier, you will still notice a noise originating from the microphone itself. This can be due to a variety of causes. For example the air molecules carried by thermal currents and colliding with the microphone diaphragm will cause noise. With dynamic microphones the noise caused by thermal movements of the electrons predominates in the resistance of the moving coil. The equivalent noise has been calculated by the German Broadcasting Authorities from the measured noise voltage and the sensitivity of the microphone. According to standard specifications the term "volume" may no longer be used for this value, as it differs widely also from the subjectively experienced volume. Consequently the term "equivalent noise" should be substituted by "signal to noise ratio" or "S/N ratio".

Free Field No-load Transmission Factor
The field no-load transmission factor is the quotient of the effective output voltage of the microphone and the effective sound pressure and has hitherto been expressed in mV/µbar. In the latest international measurement system the small µbar unit has been replaced by the Pascal.
1 Pa = 1 N/m² = 10 µbar.
Thus 1 mV/µbar is 10 mV/Pa.
The term "free field no-load transmission factor" indicates the fact that this factor has been measured in a free sound field with the microphone in no-load state, i. e. being subjected to a terminal loading. The free field no-load transmission factor is naturally dependent on frequency, as is indicated in the frequency response curve. Additionally the figure is usually specified with tolerances at 1,000 Hz. A logarithmic chart is usually helpful for plotting the frequency response curve and this is then referred to as the "free field no-load transmission level".

Free Field Transmission Level
Coupling Transmission Level
The frequency response of a headphone cannot be determined as easily as, for example, the frequency response of a microphone or loudspeaker. To date there is no coupling device or "artifical ear" capable of producing a result sufficiently equivalent to the subjectively experienced audio-impression obtained from the headphone. Consequently coupling devices can be used only for comparative measurement purposes.
The free field transmission level is determined by dynamic comparison with a progressive level soundwave (DIN 45619). In this procedure a comparison is made of the dynamic or sound levels generated alternately by a progressive level soundwave coming from the front at a constant sound pressure and by the headphone. Whereas determination of the free field response level is also subject to certain inaccuracies, it is nevertheless possible to measure headphones of all types by this means.

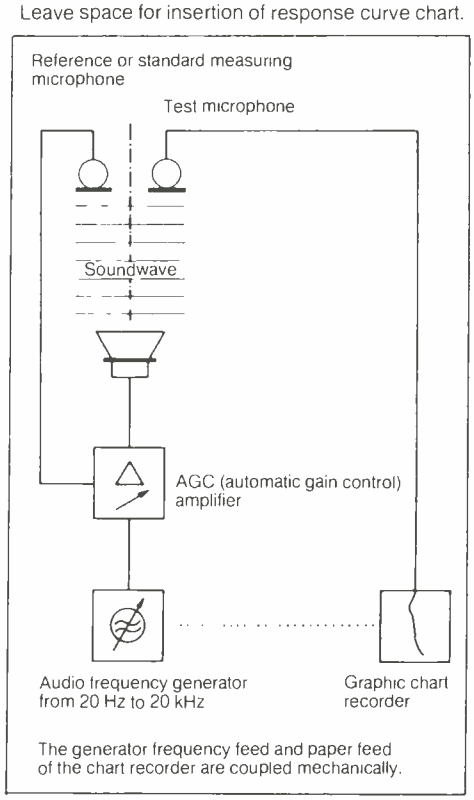
Frequency Range
The frequency range audible to the human ear is between 16 and 16,000 Hz. Oscillations below 16 Hz are described as infrasonic and oscillations



above 16,000 Hz as ultrasonic. To ensure that a sound is recorded with maximum possible fidelity the transformation of sound oscillations of varying frequencies into electrical oscillations should be totally uniform.

Frequency Response Curve
Every Sennheiser studio microphone, whether of the dynamic or capacitor type, is accompanied by the original test certificate in the form of a frequency response curve. As well as specifying the free field no-load transmission factor, which is also plotted in these test certificates, the frequency response curve reflects the criterion which is of significant importance in interpreting the quality of a microphone. It depicts the transmission path of a microphone relative to frequency, which is often also described as the frequency response. The picture shows the customary test layout used for plotting the microphone frequency curves. Normally frequency curves are recorded with the level soundwave falling vertically on the diaphragm from the front. This procedure is also often described as irradiating the microphone acoustically from a reference direction of 0°. To assess the directional relationship of the frequency response curves, particularly in the case of directional microphones, additional frequency response curves are also recorded for other sound irradiation directions, for example 90° and 180°. By uniform division of the dB scale it is also possible to make a direct comparison between frequency response curves plotted at different levels, i. e. which come to rest above or below the reference line on the frequency plotting chart. A direct comparison would not be possible with a linear scale.

Leave space for insertion of response curve chart.



Harmonic Distortion Factor
Particularly at lower frequencies the diaphragm movements will not always follow the exact pattern of the electrical audio signal. Harmonic waves are generated. The relative proportion of these harmonic waves is described as the harmonic distortion factor. Further details will be found in DIN 45403.

Headphone Contact Pressure
The wearing comfort of a headphone is determined not only by its weight but also by the force with which the ear padding is pressed into position against the ear. The unit of force is based on the international Newton N, 1 N being approx. equal to the force exerted on an underlay by a weight of 100 g.

Impedance
The impedance of a device is the ac resistance measurable at the terminals. Sennheiser headphones have values of between 17 and 2,000 ohms. This ensures easy connection with all conventional audio equipment (see "Matching"). Knowledge of the microphone impedance value is important for correct interfacing or connection with the amplifier. The terminal impedance, i. e. the input resistance of the amplifier, should always be considerably greater than the microphone impedance (voltage matching). For matching purposes it is sufficient to specify the impedance rating of the microphone. The actual impedance can vary slightly from this rated impedance.

Interference Transducer
Maximising the directional factor of a cardioid or supercardioid microphone is subject to certain limitations for physical reasons. However, the directional characteristics can be further improved by positioning a "directional tube" in front of the microphone system. This tube has a large number of sound inlet apertures which are damped in a very special manner using acoustic damping materials. Where the sound incidence angle is from the side, this layout causes partial suppression of the sound pressure within the tube as a result of which the lobar directional characteristic is obtained. The directivity factor, for example of the MKH 816, is frequency-dependent and is about 4 at low frequencies and around 11 at high frequencies.

Low Frequency Capacitor Microphone
Sennheiser manufactures low frequency condenser microphones only in the electret technology. The capsule incorporates a "frozen-in" polarisation voltage in excess of 100 V. As the electrical charge remains constant with movement of the diaphragm, an alternating voltage is generated which is fed to the gate of a field effect transistor. The field effect transistor is a component in an extremely small integrated circuit incorporated in the capsule.

Magnetic field interference factor
If a dynamic microphone is in the vicinity of a highly magnetic interference field, interference voltages can be induced in the moving coil. Consequently every dynamic Sennheiser studio microphone incorporates a compensation coil. Magnetic field lines passing through the moving coil must also pass through the compensating coil. Both coils are coupled in opposite phase to resolve in compensation of the voltages. It is customary to state the magnetic interference factor on the basis of 5 µ-Tesla and 50 Hz.

Microphone Connection Primer
This microphone connection primer is available from Sennheiser Electronic and is a fast and handy source for information on those connecting leads or adaptors required for connecting any Sennheiser microphone to European home tape recorders and cassette decks.

Microphone Polarity
If several microphones are used for a recording they must have a uniform polarity. This means that with a movement of the diaphragms in the same direction, voltages of the same polarity must also arise at the appropriate microphone outputs. If this is not the case the quality of the recording will suffer considerably, particularly at the lower frequencies. The polarity of Sennheiser microphones complies with standard specifications.

Minimum Load Impedance
Wherever possible microphones should be operated so that the minimum load impedance of the amplifier is several times the electrical impedance (source impedance). Here the frequency dependencies of the source and load impedances exert no influence on the quality of reproduction. Consequently a minimum load impedance is specified for microphones.

Noise Voltage
The noise output of a microphone can be measured with the "noise voltage meter" to DIN 45504 specifications. This device incorporates a weighting filter and peak value equalisation. Unfortunately noise voltage is not always measured in a uniform manner. Contrary to the West German specification, several manufacturers use other frequency weighting filters. In place of the peak voltage measurement the effective value is frequently measured. However, DIN 45591 specifies that noise voltage is to be measured with the noise voltage meter in accordance with DIN 45405 specifications. In comparing data it should be borne in mind that all Sennheiser microphones are measured in accordance with standard specifications.

Overload Limit
Dynamic microphones are able to handle sound pressures of such high levels that it is not necessary to specify any overload limit. In the case of condenser microphones, however, this must be specified as non-linear distortions occur when this permissible limit is exceeded.

Pressure Buildup
Sound impinging upon the microphone from the front causes reflex reactions on the diaphragm which can lead to an increase in sound pressure at high frequencies. This pressure buildup can be recognised in the frequency response of a microphone by a rise in the transmission factor at high frequencies. If, on the other hand, the sound is directed at the microphone from an angle of 90°, this rise will disappear. Consequently at high frequencies pressure microphones no longer display a precise omnidirectional characteristic but rather tend to be directionally onesided.

Pressure Gradient Transducer Microphones
These are microphones with which the sound is also channelled to the back of the diaphragm. Appropriate proportioning of the paths travelled by the sound result in generation of different directional characteristics. These include cardioid characteristics, bilateral characteristics and a variety of alternatives in between, for example these also include supercardioid characteristics.

Pressure Microphones
The diaphragm is described as a pressure microphone. When placed within a sound field the diaphragm movement within the pressure microphone is determined solely by the sound pressure path irrespective of the direction of sound incidence. A pressure microphone is thus sensitive to sound from all directions and displays spherical or omnidirectional pickup characteristics.

RF Condenser Microphones
All studio condenser microphones in the Sennheiser range use RF circuitry, whereby only a high frequency voltage of about 10 volt, generated by a low noise oscillator (8 MHz) is fed to the capsule in place of the high polarity voltage which is otherwise necessary. The low capsule impedance enables the microphones to achieve high operating reliability.

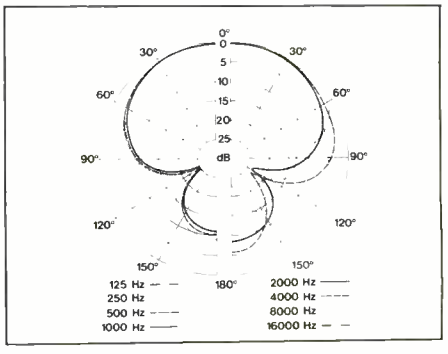
Rated Frequency Curve
The rated frequency curve (heavy continuous line) is depicted in the following technical descriptive data. Certain minor deviations from this desired or rated frequency curve occur as a result of unavoidable dispersions during production and these are specified in the technical data in dB as a maximum variation from the rated frequency response. Each rated frequency response curve is depicted with the permissible tolerance range from the actual frequency curve.

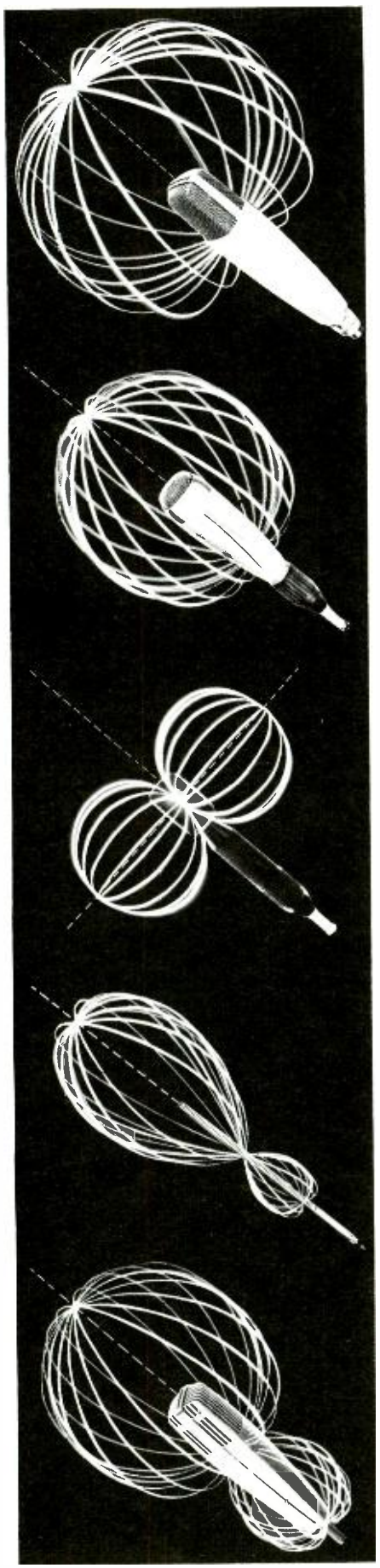
Rated Loadings
These represent the limit of operational continuous loading on headphones. A special noise signal is used to test the load rating in accordance with DIN 45582 specifications.

Sensitivity
This term, which is still in extensive use today and describes the electrical output level of a microphone as a function of the sound pressure level, has been substituted in standard specifications by the more accurate term "free field no-load transmission factor".

Signal to Noise Ratio
In the following microphone descriptions we have frequently referred to the signal to noise ratio, which is related to a useful sound pressure of 1 N/m^2 = 1 Pa. Conversion to the previous equivalent noise level is achieved quite easily bearing in mind that 1 Pa represents a noise level of 94 dB. To arrive at the equivalent noise level it is merely necessary to deduct the signal to noise ratio from this 94 dB. For example, if the signal to noise ratio is 70 dB, the equivalent noise level is 24 dB.

Sound Field
This term is used to describe the area between a sound source and a sound receiver. Viewing the spherical propagation of the soundwaves from a sound source, the spherical surfaces display a marked curvature in the vicinity of the sound source. Only after a considerable distance has been traversed has the radius of curvature increased to the point where the soundwave front has become virtually a flat surface. The area in which the spherical surface are still sharply curved is described as the near field and that in which the spherical surfaces have flattened to a level plane is





described as the far field. The sound pressure decreases in reverse proportion to increasing distance from the sound source. With gradient microphones a role is played by the curvature of the wave front. Closer proximity to the sound source causes a particularly marked rise in reproduction of the lower frequencies (proximity effect).

Sound Pressure
Any solid body moving through a resiliently ductile or shapeable medium will generate sound waves. These sound waves are designated by the sound or excess pressure (sound pressure). Previously the unit of measurement for sound pressure was the µbar and today the international measurement has been adopted of the Pascal (Pa). 10 µbar = 1 Pa. Human speech directed at a microphone from a distance of approx. 1 m will generate a sound pressure of approx. 1 µbar = 0.1 Pa. If the microphone is approached to a distance of about 10 cm it receives a noise pressure of approx. 1 Pa. Particularly with headphones, sound pressure levels are specified in dB. These are related to the standardised audible threshold of 2×10^{-5} Pa (0 dB $\pm$ 2×10^{-5} Pa).

Sound Pressure Level
Characteristic sound pressure level of a headphone is the sound pressure level at which an electrical output of 1 mW is achieved. This is measured with the aid of the artificial ear type 4153 from Brüel & Kjaer.

Supraaural (see "Acoustical Coupling")

Supercardioid Characteristics
Maximum suppression of interference noise in relation to spatially uniformly distributed noise is offered by the hypercardioid microphone with a directivity factor of 4. This has the disadvantage of suppressing noise from 180° only by 50%. The Sennheiser supercardioid microphone has been created from the attempt to achieve an optimum between the hypercardioid and cardioid versions. This offers uniform suppression for 90° and 180° while nevertheless still achieving, at 3.86, virtually the same directivity factor as the hypercardioid.

Symmetrical Microphone Connection
The microphones are connected electrically to amplifiers and tape recorders either in symmetric or asymmetric circuit. With the symmetrical circuit the two cores of the connecting lead are of equivalent electrical value relative to the housing of the microphone or the lead screening. As a result of symmetric circuitry external disturbance (e. g. hum pickup) cannot affect the following amplifier even with long lead lengths and moderate lead screening as this interference is exerted uniformly on both lead cores and cancels itself out.

Transmission Range
The transmission range is the frequency range specified by the manufacturer as useful for sound irradiation or pickup. The desired or rated frequency response specified in relevant technical data for the headphone or microphone in question applies for the transmission range.

Wiring Circuit Designations
In the detailed descriptions of our microphones you will find, the following codes: N, LM, K-2 or to U.
The letter N designates that the microphone is fitted with a standard connector plug to DIN 41 524 specifications and connected for low impedance balanced connection to pins 1 and 3 to DIN 45 594 specifications.
This type of microphone can be connected with up to 200 m of two-core screened cable to tape recorders or amplifiers with low-impedance inputs. In the case of high-impedance inputs it is essential to interpose a step-up transformer at the amplifier end of the cable.
The letters LM designates microphones designed for connection to medium and low-impedance inputs on transistorised tape recorders. The bridge between pins 1 and 3 in the plug render these microphones suitable for connecting to a wide range of tape recorders.
The suffix -2 denotes that the microphone in fitted with a symmetrically wired Tuchel plug to DIN 41 624 specifications. The letter U denotes that the microphone is suitable for use with Cannon connectors.
The foregoing wiring modes are depicted in the wiring diagrams.

Which Sennheiser microphone is best for which recording?

Which Sennheiser microphone for which users?

Choosing the correct microphone causes any number of problems not only for the amateur but also in some cases for the professional. Whereas the amateur will frequently be looking for only one microphone for the most varied recording situations, the professional will often be seeking special-purpose microphones for the most varied range of tasks in sound pickup or transmission. The following summary is intended to simplify choosing the ideal microphone for all users.
Initially we have made only a rough division, based on a distinction between amateurs, semi-professionals and professional users. Naturally the quality and features of any microphone increase in proportion to the price. Higher technology demands the deployment of greater production technology and this obviously costs more money. If you initially check your requirements against one of the three groups this will give you an approximate idea of what you need. At this stage the decisive factor is whether you wish to make tape recordings or if you intend to concentrate the use of your microphone on sound transmission. Experts are well aware that an important criterion for selecting a microphone is also the place where the recording is being made and whether you wish to transmit or pick up speech or music. If you have decided on one of these particular applications you have a choice of several microphones. You will find that these same microphones also appear in other areas. This confirms that the microphone you have chosen is also capable of fulfilling its functions in other applications. In this Revue you will find a detailed description for each microphone. The following tables do not include "wireless" microphones and "test probe" microphones.

Microphones for the amateur user

Low Cost	Medium Cost	High Cost	
Recording / General Use	Recording / General Use	Recording / General Use	
Speech / music	Speech / music	Speech	Music
MD 200 MD 400 MD 402 MD 412	MD 21 MD 412 MD 416 MD 417 MD 419	MD 21 MD 211 MD 419 MD 421 MD 441	MD 211 MD 416 MD 419 profipower MD 421 MD 441
	MKE 10-3 + K 3 * ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 10 LM MKE 10-6 MKE 40-6 MKE 40-3 + K 3 *	MKE 10-3 + K 3 * ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * ME 88 + K 3 * MKE 10 MKE 10 LM MKE 10-6 MKE 2002 MKE 40-6 MKE 40-3 + K 3 *	ME 40 + K 3 * ME 80 + K 3 * MKE 2002

* optionally K 30 AV

Microphones for the semi-professional user

Medium Cost

Recording use				General use			
Internal		External		Internal		External	
Speech	Music	Speech	Music	Speech	Music	Speech	Music
MD 21 MD 211 MD 417 MD 419 MD 421	MD 211 MD 416 MD 419 profipower MD 421	MD 21 MD 211 MD 417 MD 419 MD 421	MD 211 MD 416 MD 419 profipower MD 421	MD 430 MD 908 MD 416 MD 417 MD 421	MD 416 profipower MD 419 MD 421	MD 21 MD 211 MD 430 MD 908 MD 417 MD 419 MD 421	MD 211 MD 416 MD 419 profipower MD 421
MKE 10-3 + K 3 * ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 10 MKE 10 LM MKE 10-6 MKE 2002 MKE 40-3 + K 3 * MKE 40-6	ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 2002	MKE 10-3 + K 3 * ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * ME 88 + K 3 * MKE 10 MKE 10 LM MKE 10-6 MKE 2002	ME 20 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 2002	MKE 40-3 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 40-6	ME 40 + K 3 * ME 80 – K 3 *	MKE 40-3 + K 3 * ME 40 + K 3 * ME 80 + K 3 * ME 88 + K 3 * MKE 40-6	ME 40 + K 3 * ME 80 + K 3 *

* optionally K 30 AV

High Cost

Recording use				General use			
Internal		External		Internal		External	
Speech	Music	Speech	Music	Speech	Music	Speech	Music
MD 21 MD 211 MD 416 MD 419 MD 421 MD 441	MD 211 MD 416 profipower MD 421 MD 441	MD 21 MD 211 MD 416 MD 419 MD 421 MD 441	MD 21 MD 211 MD 416 profipower MD 419 MD 421 MD 441	MD 430 MD 908 MD 416 MD 419 MD 421 MD 441	MD 416 profipower MD 419 MD 421 MD 441	MD 21 MD 211 MD 430 MD 908 MD 416 MD 421 MD 441	MD 211 MD 416 MD 419 profipower MD 421 MD 441
ME 80 + K 3 * MKE 10 R MKE 2002	MKE 2002	ME 80 + K 3 * ME 88 + K 3 * MKE 10 R MKE 2002	ME 80 + K 3 * MKE 40 R	MKE 42 MKE 40-3 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 40 R	ME 40 + K 3 ME 80 + K 3	MKE 40-3 + K 3 * ME 40 + K 3 * ME 80 + K 3 * MKE 88 + K 3	ME 40 + K 3 * ME 80 + K 3 *
MKH 106 MKH 406 MKH 416 MKH 816	MKH 106 MKH 406 MKH 416	MKH 416 MKH 816	MKH 106 MKH 406 MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 416 MKH 816	MKH 406 MKH 416 MKH 816

* optionally K 30 AV

Microphones for the professional user

Recording use

Internal							External					
Disc, TV, radio					Film, Video (Sync.)		Reporting or com-mentary	Film, Video disc		Concert performances		
Classical music		Light entertainm. music								Classical music		light entertainm. music
Instrument	Vocal	Instrument	Vocal	Spreech	Speech	Music		Speech	Music	Instrument	Vocal	Instrument	Vocal
MD 441	MD 441	MD 416 MD 419 MD 421 MD 441	MD 211 MD 416 profi-power MD 441	MD 211 MD 421 MD 441	MD 211 MD 421 MD 441	see play-back	MD 21 MD 211 MD 214 MD 421 MD 441		see play-back	MD 441	MD 211 MD 441	MD 416 MD 421 MD 441	MD 211 MD 416 profi-power MD 441
					MKE 10 R ME 80 + K 3 *		MKE 10 R MK 12 + MH	MKE 10 R ME 80 + K 3 *					
MKH 106 MKH 406 MKH 416	MKH 406 MKH 416	MKH 416		MKH 106 MKH 406 MKH 416	MK 12 + MH MKH 106 MKH 406 MKH 416 MKH 816		MKH 416 MKH 816	MK 12 + MH MKH 416 MKH 816		MKH 106 MKH 406 MKH 416	MKH 406 MKH 416 MKH 816		

* optionally K 30 AV

General use

Internal							External				
Concert, TV, radio (live)				Theatre	P. A.	Reporting, commentary discussion	P. A.	Concert, TV, radio (live)			
Classical music		Light entertainment music						Classical music		Light entertainm. music	
Instrument	Vocal	Instrument	Vocal					Instrument	Vocal	Instrument	Vocal
MD 441	MD 211 MD 441	MD 416 MD 421 MD 441	MD 416 MD 419 profipower MD 421 MD 441	MD 441	MD 430 MD 908 MD 416 MD 419 MD 421 profipower MD 441	MD 214 MD 21 MD 419 MD 421 MD 441	MD 908 MD 416 MD 419 MD 421 profipower MD 441 MD 430	MD 421 MD 441	MD 441	MD 416 MD 421 MD 441	MD 416 MD 419 profipower MD 421 MD 441
ME 80 + K 3 *		MKE 10 R		ME 40 + K 3 * ME 80 + K 3 *	MKE 42 MKE 10 R MKE 40 R ME 80 + K 3 *	ME 40 + K 3 * ME 80 + K 3 *	ME 80 + K 3 *		MKE 10 R		
MKH 406 MKH 416 MKH 816	MKH 406 MKH 416	MKH 406 MKH 416 MKH 816		MKH 416 MKH 816	MKH 406 MKH 416	MK 12 + MH MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 406 MKH 416 MKH 816	MKH 416

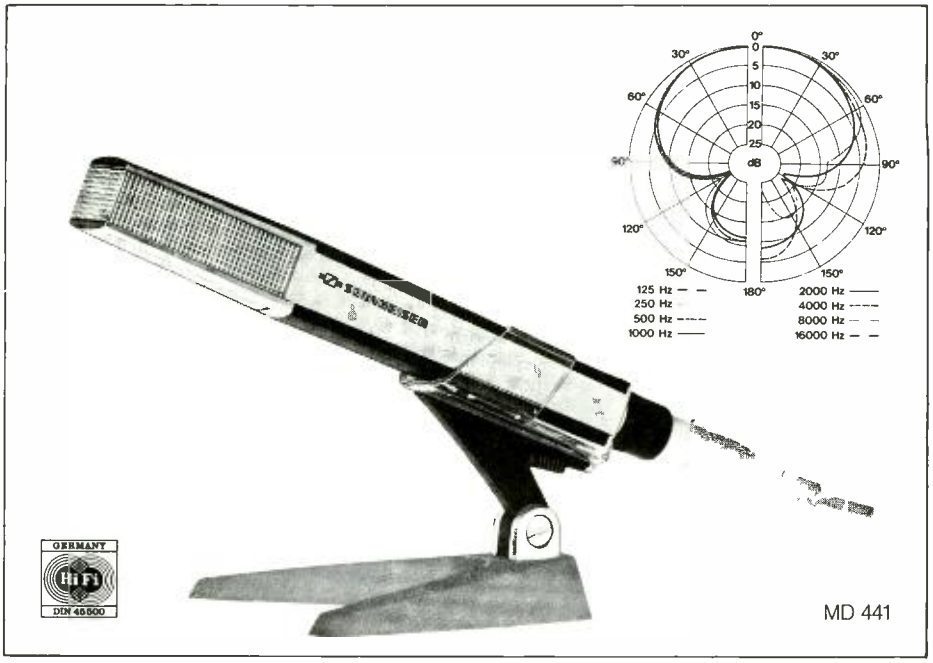
* optionally K 30 AV

1 DYNAMIC MICROPHONES

Sennheiser has been developing dynamic microphones for a long time. They are rugged, reliable and easy to use and therefore the same principle has been employed for a wide range of special models.
For instance, many owners of cassette recorders choose the supercardioid MD 402 or MD 412 microphone models in preference to the less professional microphones which usually accompany these machines. Directional studio microphones such as the MD 421 and MD 441 are in permanent use not only in TV and radio stations but also in recording studios and even by the more discriminating tape recording amateurs. The musician's microphones "profipower" and MD 416 are favoured by an increasing number of well-known singers and pop groups. The MD 430 PA microphone is especially suitable for announcements in noisy surroundings and the MD 321 probe microphone is ideal for pinpointing specific noises at difficult to reach points in machinery and equipment.

1 Directional Studio Microphones

MD 441 N · MD 441-2 · MD 441 U



Frequency range: 30 to 20,000 Hz.
Directional characteristic: supercardioid.
Supercardioid, defies feedback.
Optimum protection against handling owing to shock-mounted capsule.
Distortion-free transmission even under highest sound pressure.
Ten different, switchable response curves.
Hum-bucking coil.
Built-in pop filter.
Quick-release clamp.

Over many years development of this top-of-the-range microphone, the declared intention of Sennheiser was to achieve at least the electro-acoustical transmission characteristics of condenser microphones with a dynamic transducer system. Repeated blind listening tests have proved that the objective has been achieved. Owing to the pioneering use of diaphragm thicknesses of less than 10 µm for dynamic microphones, the temperature-independent internal shock mount with low resonance frequency and the almost uniform directional chart which has been achieved at all frequencies, the MD 441 is the best dynamic directional microphone Sennheiser has to offer. There is no better available anywhere in the world.

This microphone is intended especially for use in radio and TV broadcasting, as a speaker's microphone for top-grade PA installations, a vocalist and instrumental microphone for particularly discriminating soloists and groups and for the fully and semi-professional tape recording amateur. A presence switch emphasises the area above 5 kHz.

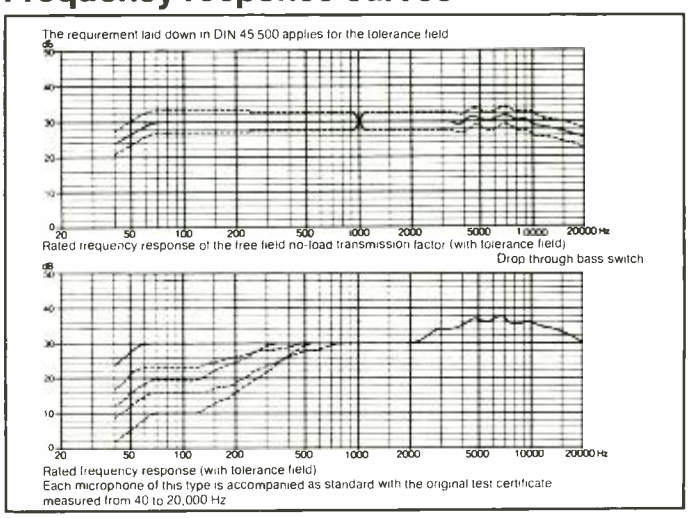
The all metal housing on all versions of the MD 441 has a satin chrome finish; two opposing grip surfaces are covered with a black leather-type finish. The microphone always includes a quick-release mounting in which the microphone can be held either clamped or unclamped.
You will find the relevant technical data and differences between the various models in the summary on pages 32 to 35.

Small Tuchel plug	Large Tuchel plug	"Cannon" plug
N	-2	U

Recommended accessories

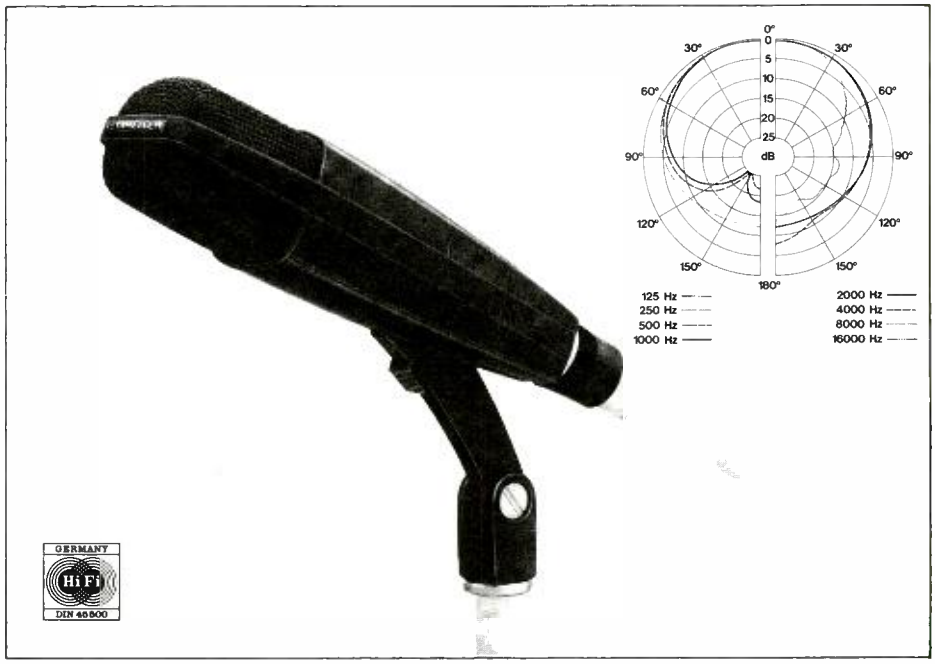
Windscreen	Desk stands	Clamps	Floor stands
MZW 441 MZW 40	MZT 441 MZT 100	MZA 441 MZT 237 MZS 235	MZS 144 MZS 210 MZS 142
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
MZH 141 (-2)		MZS 211	DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)

Frequency response curves



1 Directional studio microphones

MD 421 N · MD 421-2 · MD 421 U-4 · MD 421 U-5



Frequency range: 30 to 17,000 Hz.
Directional characteristic: cardioid, low acoustic feedback.
Reduced handling noise and no overload, even at extremely high volume.
Five-step variable bass controll with the MD 421 N, MD 421 U-4 and MD 421 U-5.
Hum compensation coil.
Quick-release clip.

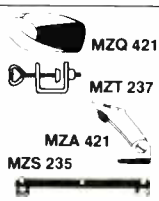
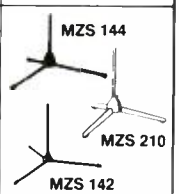
This dynamic directional studio microphone was developed some 20 years ago and still fulfils the stringent requirements of radio and TV broadcasting. For example, large quantities have recently been exported in exploiting the USA market. The deliberate rise in frequency response above 3 kHz results in a particularly brilliant standard of transmission and constituted a totally new approach at the time, which still remains equally as welcome today. At the low end of the range a built-in bass equaliser allows adjustment in five defined stages with the MD 421 N, MD 421 U-4 and MD 421 U-5 version.

This microphone is intended particularly for use in radio and TV broadcasting, especially for reporters and presenters, as a lecturer and conference microphone in high-grade public address systems and for the most demanding vocalists and instrumentalists as well as for the discriminating tape recording amateur.

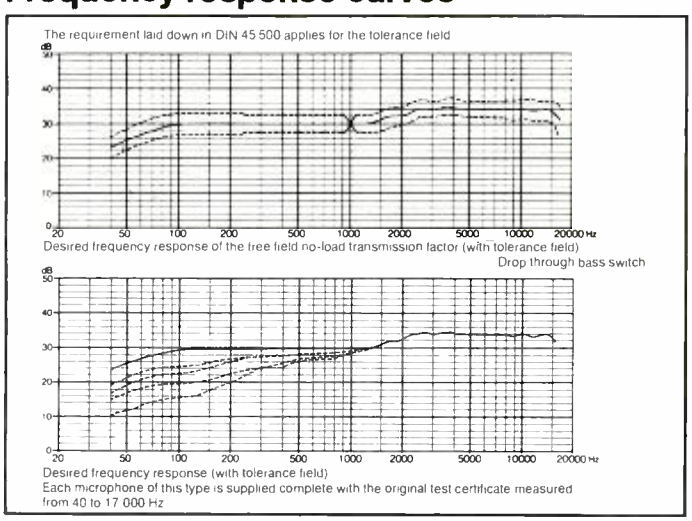
The housing used for all versions of the MD 421 is of impact-proof plastic, with the MD 421 N and MD 421-2 in light grey. with the MD 421 U in matt black. The MD 421 N and MD 421-2 includes as standard a quick-release clip which can be changed in a moment for a fixed mount.
MD 421 U-4 black with Cannon plug
MD 421 U-5 black with adapter thread and Cannon plug
Technical data and differences between the versions will be found in the summary on pages 32 to 35.

Small Tuchel plug	Large Tuchel plug	"Cannon"-plug
 N	 -2	 U

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
 MZW 421 MZW 40	 MZT 421 MZT 12 (-2) MZT 100	 MZQ 421 MZT 237 MZA 421 MZS 235	 MZS 144 MZS 210 MZS 142
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
 MZH 21 MZH 141 (-2)		 MZS 211	DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)

Frequency response curves



1 Supercardioid Directional Microphone

MD 419 N · MD 419 N-T · MD 419 U · MD 419 U-T

Frequency response: 30 to 15,000 Hz.
Directional characteristic: supercardioid.
Outstanding directivity.
Directional characteristics independent of frequency.
Three switchable frequency responses.
Insensitive to handling noise.
Protective insulation.

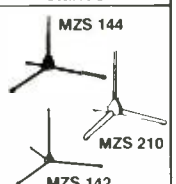
The MD 419 is the ideal basis for entering into microphone recording technology at the professional level. The advanced tape recording amateur wishing to tape speech and music in high quality above DIN 45500 specifications, even under unfavourable acoustic conditions, will opt for this supercardioid directional microphone. It is low impedance to the same standard as the capacitor microphones so popular in studio use.

The spring-mounted microphone system with its supercardioid characteristics can thus be classed among the directional microphones. The internal suspension eliminates handling noises from the microphone system. The MD 419 is equipped with a three stage bass switch allowing elimination of distortion at the microphone itself without any need for a mixer desk. The MD 419 is therefore a true directional microphone with supercardioid characteristics.

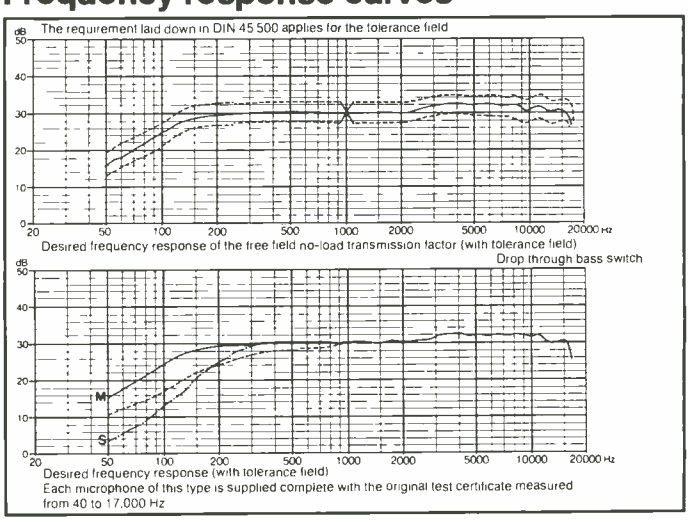
It is supplied as standard with a quick-release clip and stand connector with $^{3}/_{8}$", $^{1}/_{2}$" and $^{5}/_{8}$" thread. The microphone connection is of the plug coupling type.
The microphone is available in the following versions: MD 419 U with Cannon plug, MD 419 U-T with Cannon plug and switch, MD 419 N with small Tuchel plug, MD 419 N-T with small Tuchel plug and switch.
Technical data and differences between the various models will be found in the summary on pages 32 to 35.

Small Tuchel plug		"Cannon" plug
 N		 U

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
 MZW 421 MZW 441  MZW 40	 MZT 441  MZT 100	 MZT 237  MZS 235	 MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
 MZH 21		 MZS 211	DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)

Frequency response curves



1 Supercardioid Directional Microphone

MD 417 K · MD 417 LM · MD 417-6

MD 417

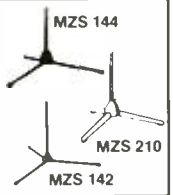
Frequency range: 50 to 15,000 Hz.
Directional characteristic: supercardioid.
Superlative directivity.
Directional characteristics independent of frequency.
Protective insulation.
Insensitive to handling noise.
Bass roll off switch.

The MD 417 is the most desirable basis leading up to a fully professional microphone for the dedicated tape or sound film amateur looking for a directional microphone with good characteristics. Its broad frequency response fulfils the requirements laid down in HiFi standard specification DIN 45500. This directional microphone displays supercardioid characteristics and therefore absorbs most of the sound coming from the front. This clearly eliminates undesirable extraneous noise, for example from film or sound recording equipment, ensuring satisfactory recording even under difficult conditions.

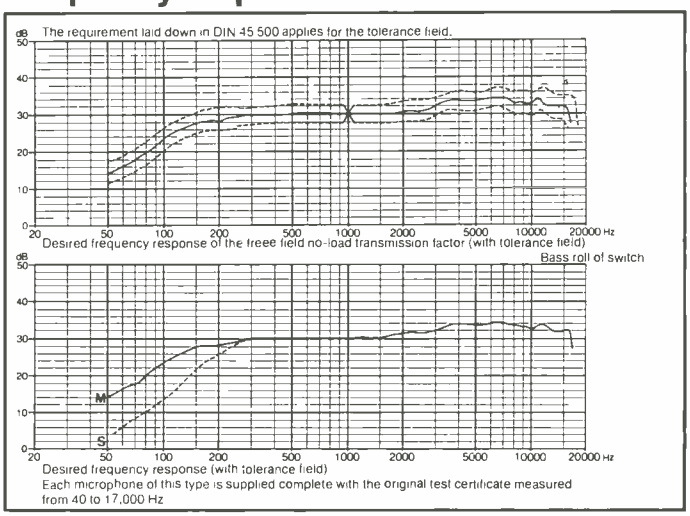
The resilient mounting of the actual transducer system eliminates most of the handling noises when used as a hand microphone. A switchable filter permits rolling off of the lower frequency response range, a particularly useful feature for speech recording. The MD 417 microphone is available with three different types of plug coupling. The MD 417 K with 6.3 mm jack, MD 417 M with 3-pin DIN plug, MD 417-6 with 3.5 mm jack.

The microphone is fitted with a quick-release clip with $^3/_8$'' thread. A collapsible desk stand is also supplied as standard.
The technical data and differences between the various models will be found in the summary on pages 32 to 35.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
 MZW 421 MZW 441 MZW 40	Included as standard	 MZT 237 MZS 235	 MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
MZH 21		 MZS 211	

Frequency response curves



1 Supercardioid Directional Microphones

MD 412 K · MD 412 LM

Frequency range: 50 to 14,000 Hz.
Supercardioid characteristics.
Built-in speech/music switch.
Fixed 2 m connecting lead.
Suitable for all type recorders with low-impedance and medium-impedance inputs.

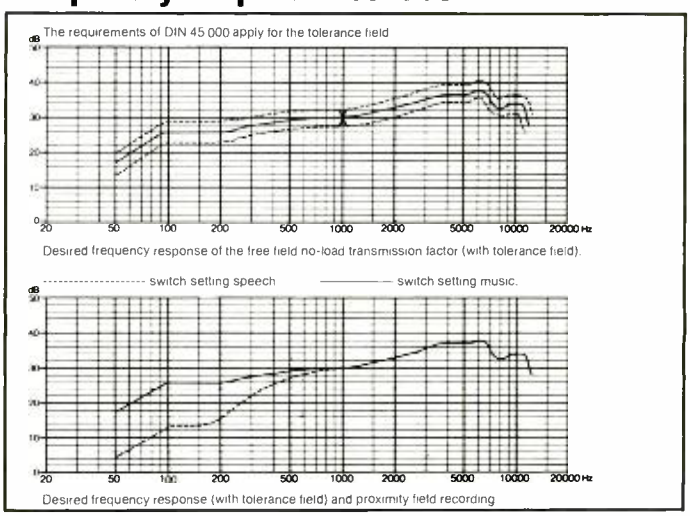
The appearance and the design of the studio microphones MD 441 and MD 421 are synonymous with high quality. Ambitious audio amateurs throughout the world were looking for a less costly microphone with similar looks and at least the strict performance requirements laid down in DIN 45500. The MD 412 supercardioid directional microphone was developed to fill this need. Owing to its intended use, particularly for the amateur, Sennheiser placed particular emphasis on achieving a distinct directional pattern in order to eliminate undesirable background noise as far as possible. The windscreen which is also supplied as standard can be used as a further measure to guard against undesirable wind noise when recording in open air conditions. The integral speech/music switch finally eliminates the low frequency rises otherwise caused by close talking distances and which is typical for all directional microphones.

The housing of the MD 412 is in matt black impact-proof novodur plastic. Included as standard is a matt black desk tripod with a microphone mounting which can be detached and fastened to any floor stand with $^3/_8$" thread. The yellow expanded foam windscreen is also included as standard.
The technical data and differences between the various models will be found in the summary on pages 32 to 35.

Recommended accessories

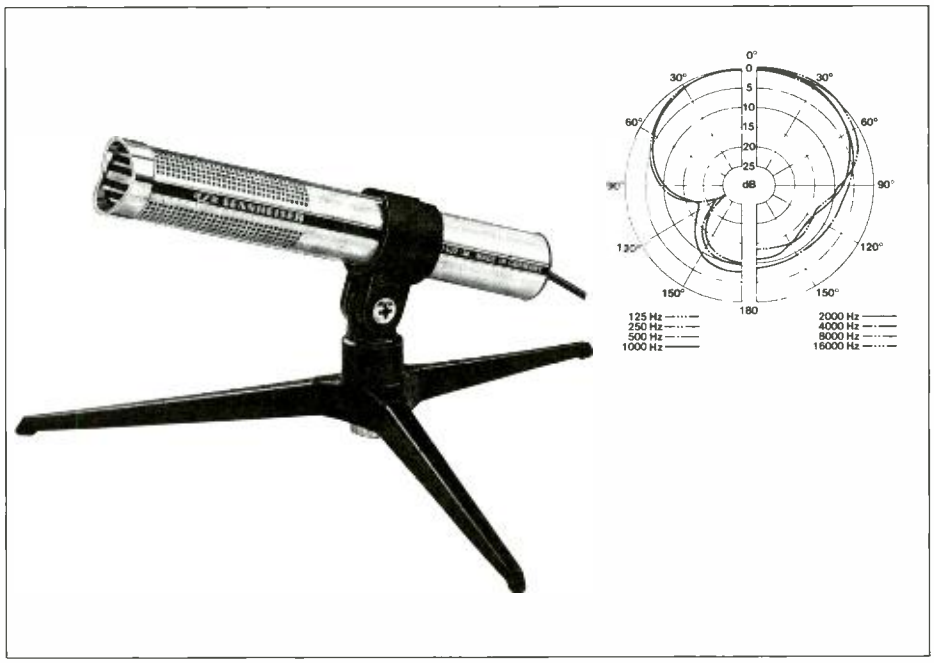
Windscreen	Desk stands	Clamps	Floor stands
MZW 412 MZW 416-1	Included as standard	MZT 237 MZS 235	MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		MZS 211	

Frequency response curves



1 Supercardioid Directional Microphones

MD 402 K · MD 402 LM · MD 402 U-Set



Frequency range: 80 to 13,500 Hz.
Supercardioid characteristic.
All-steel housing.
Suitable for connection to all tape recorders with low-impedance or medium-impedance inputs.

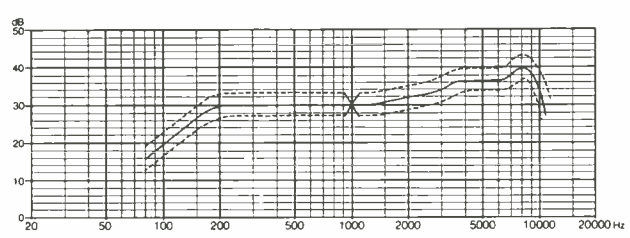
Virtually all cassette recorders and the simpler tape recorders always include a microphone as standard. Unfortunately the accompanying microphones are very often of very simple construction which rapidly takes away the pleasure which should be experienced when making your own recordings by microphone. Sennheiser intend to prevent this disappointment by means of a reasonably priced high-quality microphone with supercardioid directional characteristics: the MD 402 produces amazingly good quality recordings also on simple cassette recorders and even in an unfavourable acoustic environment. It suppresses interference noises and concentrates on picking up the useful noise. The all-steel housing renders this microphone extremely rugged and reliable, so that it is extremely simple to operate, even for the unpractised amateur.

The housing of the MD 402 consists of an aluminium-sheathed or steel tube incorporating the dynamic transducer system in the front end protected by a chrome-plated speech aperture guard and at the rear end the 1.5 m connecting lead is protected against damage by a space-saving anti-kink sleeve. A special version of the MD 402 U-Set is provided with a Cannon connector complete with a 5 m detachable lead. All versions come complete with matt black desk stand and the microphone mounting can be detached and fitted to any floor tripod with $^3/_8$'' thread.
The technical data and other differences between the various versions will be found in the summary on pages 32 to 35.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 30	Included as standard	MZT 237 MZS 235	MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		MZS 211	DA 5 UK *

Frequency response curves



Rated frequency response of the free field no-load transmission factor (with tolerance field)

1 Amateur Microphone

MD 400 K · MD 400 LM · MD 400-6

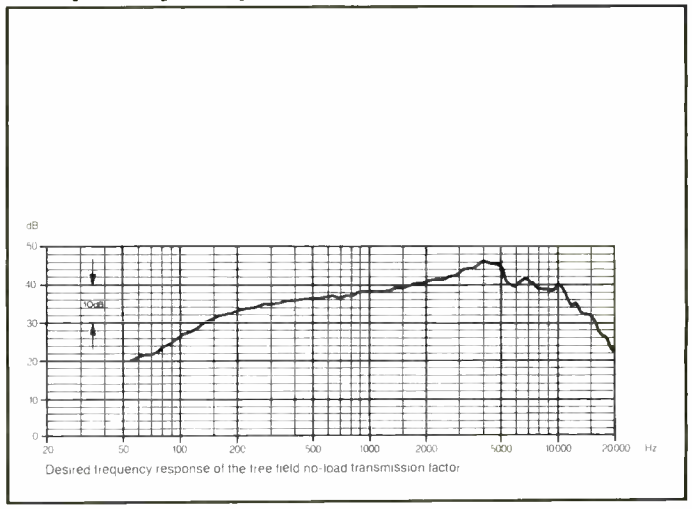
Frequency range: 60 to 13,500 Hz.
Supercardioid characteristic.
Complete with desk stand.
1.5 m connecting lead.
For all cassette recorders, sound film projectors and sound film cameras with medium-impedance inputs.

As with the MD 200 omnidirectional microphone, the MD 400 directional microphone is also suitable for the majority of cassette recorders, sound film projectors and sound film cameras available on the market. It replaces the frequently somewhat primitive standard microphone which failed to produce recordings in the required quality. In the MD 400, Sennheiser offers a reasonably priced alternative combined with high-grade recording quality. Its supercardioid characteristics render it particularly suitable for recording in acoustically unfavourable rooms where there is a tendency to echo. It is also suitable for use without any difficulty in the presence of pronounced background noises, as it screens interference noises coming from the side and rear, so that its maximum recording sensitivity is directed towards the front. The housing of the microphone is in novodur plastic. The 1.5 m connecting lead is protected against damage by an anti-kink sleeve (available in three connector versions: 6.3 mm jack plug, 3-pin DIN plug, 6.5 mm jack plug). This microphone is supplied complete with a matt-black desk top stand.
Technical data will be found on pages 32 to 35.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 412 MZW 416-1	Included as standard	MZT 237 MZS 235	MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		MZS 211	Included as standard

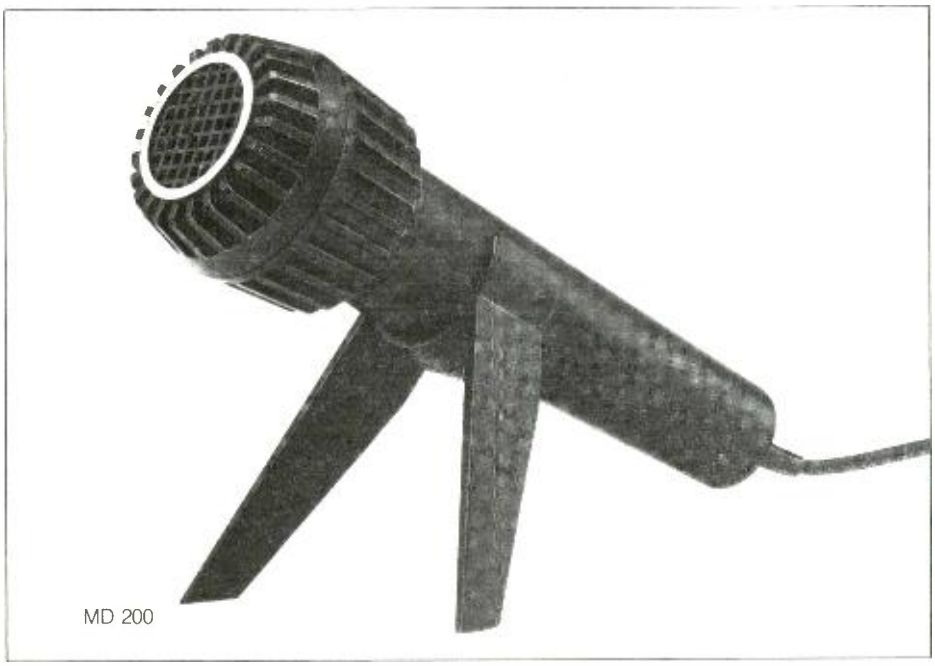
Frequency response curves



Desired frequency response of the free field no-load transmission factor

1 Amateur Microphones

MD 200 K · MD 200 LM · MD 200-6



MD 200

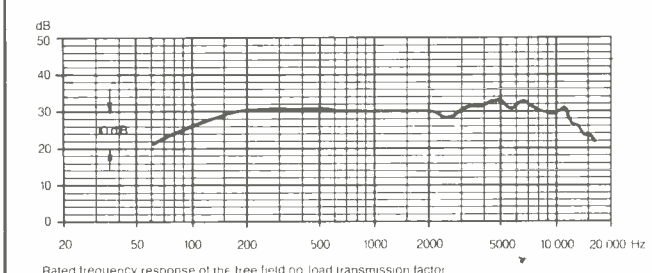
Frequency range: 60 to 13,500 Hz.
Directional characteristic: omnidirectional.
Complete with desk top stand.
1.5 m connecting lead.
For all cassette recorders, sound film projectors and sound film cameras with medium-impedance inputs.

Most of the cassette recorders, sound film projectors and sound film cameras currently available on the market are still being supplied with extremely simple standard microphones. With many amateurs this spoils the pleasure from their hobby owing to resultant poor quality. With the high-quality but reasonably priced MD 200 microphone, Sennheiser offers a sensible alternative to these amateurs. Owing to its low handling noise sensitivity it is ideal for use also as a hand microphone. The omnidirectional characteristics of the MD 200 ensure that the sound is picked up uniformly from all directions. The housing of the microphone is of Novodur plastic. The 1.5 m connecting lead is protected against damage by an anti-kink sleeve (the following connection possibilities are available: 6.3 mm jack plug, 3-pin DIN plug, 3.5 mm jack plug). The microphone is supplied with a matt-black desk top stand as standard.
The technical data will be found on pages 32 to 35.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 412 MZW 416-1	Included as standard	MZT 237 MZS 235	MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		MZS 211	Included as standard

Frequency response curve



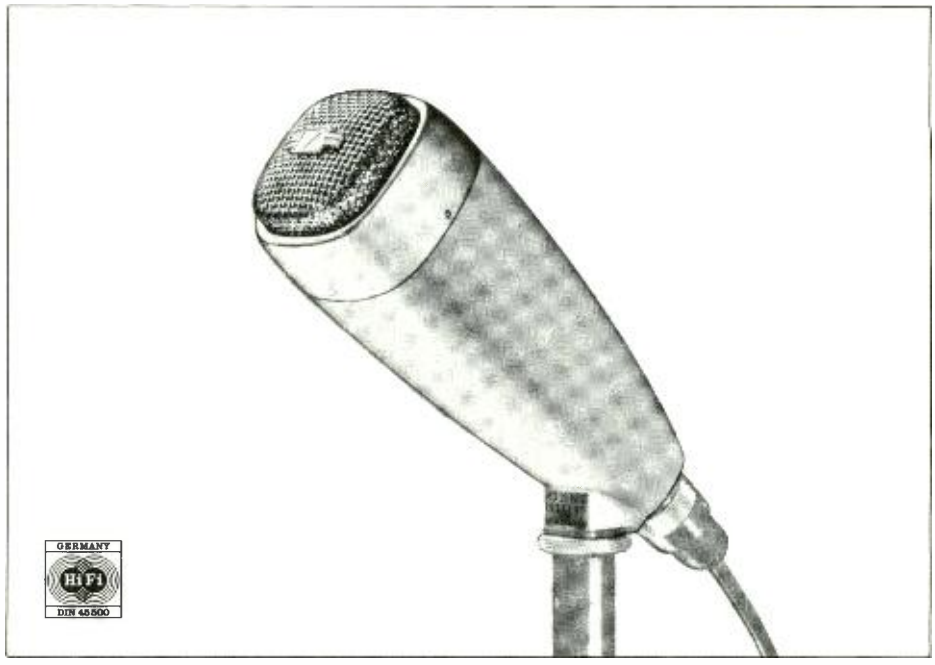
Rated frequency response of the free field no load transmission factor

1 Studio Microphones

MD 21 N · MD 21-2 · MD 21 U

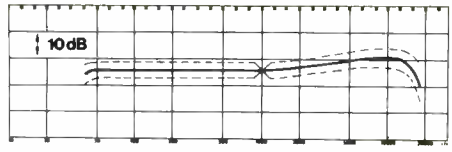
Frequency range: 40 to 18,000 Hz.
Omnidirectional characteristic.
Insensitive to handling and wind noises.
Extremely rugged zinc diecast housing.

This classic studio microphone has probably been used by most broadcasting presenters at some time or another in their careers: the rugged design features render it perfect for use in rough day to day conditions.
For some decades this has represented the standard for comparison in assessing dynamic studio microphones in general, owing to its wide frequency response with deliberate presence emphasis above 3,000 Hz. Since its inception, the repair quota for this model has been less than 0.1 %.
The technical data and differences between the various models will be found in the summary on pages 32 to 35.



Small Tuchel plug	Large Tuchel plug	"Cannon" plug
 N	 -2	 U

Recommended accessories	applicable directly ● applicable indirectly □ only for model 2 (-2)
Close talking and windscreen protection Desk and floor stands	MZW 421 ●, MZW 416-1 ● MZT 12 ● (-2), MZT 21 ●, MZS 144 ●, MZS 210 ●, MZS 235 ●, MZS 211 ●
Boom/bar Flexible necks Clamps Basic leads	MZH 21 ●, MZH 141 ● (-2), MZT 237 ●, DA 1 HL ●, DA 7 N ●, DA 7 NL ●, DAV 5 ● (-2)

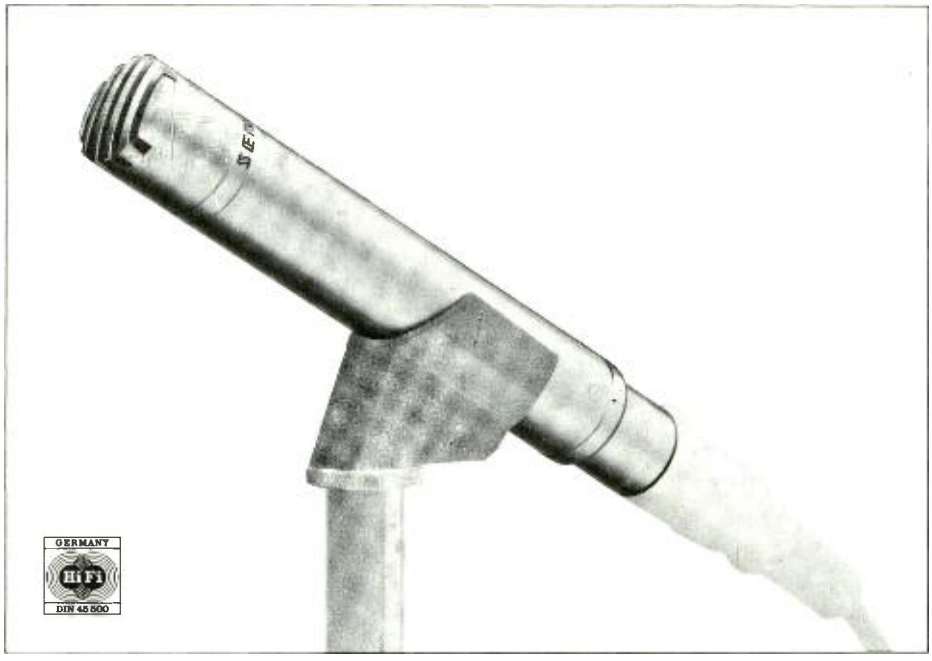


Rated frequency response (with tolerance field).

MD 211 N · MD 211 U

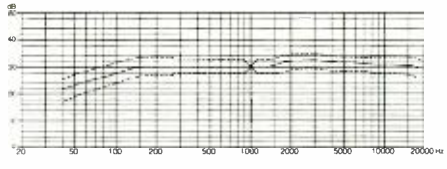
Frequency range: 30 to 20,000 Hz.
Omnidirectional characteristic.
Insensitive to handling noise.
No distortion, even at highest sound pressure levels.
No proximity effect even at close miking distance.
Quick-release clip.

The MD 211 was developed from the desire to achieve a design slimmer and lighter than the MD 21 but which afforded at least the same excellent acoustical characteristics of that model. The successful Tom Jones TV show has made this microphone known throughoud the world. In professional circles the small, slimline MD 211 is regarded as a particularly versatile studio microphone for high quality sound recordings. The omnidirectional characteristic prevents any voice distortion even at extremely close speaking distances.
The all-metal one-piece housing of the MD 211 is in satin chrome finish. Standard equipment includes a quick-release clip.
Technical data and differences between the various models will be found in the summary on pages 32 to 35.



Recommended accessories	applicable directly ● applicable indirectly □ only for model U (-U)
Close talking and windscreen protection Desk and floor stands	MZW 30 ●, MZW 201 ● MZT 104 ●, MZT 105-1 ●, MZS 144 ●, MZS 210 ●, MZS 235 ●, MZS 211 ●
Boom/bar Flexible necks Clamps Basic leads	MZH 142 ●, MZT 237 ●, MZA 406 ●, DA 5 NM-T ●, DA 1 HL ●, DA 7 N ●, DA 7 NL ●, KA 7-1 ● (-U), KA 7-U ● (-U)

The requirement of DIN 45 500 applies for the tolerance field



Rated frequency response of the free field no-load transmission factor (with tolerance field)

1 Musician's Microphone »*profi*power« · »*profi*power« set

MD 431 U

Frequency range: 40 to 16,000 Hz.
Supercardioid directional characteristic allows extremely high volume before feedback occurs.
Optimum damping of handling noise owing to spring-mounted system suspension in all-metal housing.
Hum compensator coil.
Shock-tested.
Built-in impact noise filter.
Built-in pop filter.
Noiseless reed switch.
Quick-release mounting clip.
Suitable for connection to all musical instrument amplifier systems.

This is probably the first time that a microphone manufacturer has incurred such considerable outlay to determine the genuine requirements of the special microphone user and then to transform those efforts into a new purpose-built product. The "tailormade" frequency response pattern depicted below was achieved only after numerous comparative listening sessions with professional musicians. It was thus possible to develop the directional characteristic independent of frequency so that the much feared onset of feedback is avoided even at maximum power. The shock-mounted system with metallic springs remains unaffected by temperature ensuring together with the built-in impact noise filter, an extraordinarily high standard of handling noise damping. The shock protection is in excess of the most stringent requirements which might be imposed by the user. For the first time in a musican's microphone, Sennheiser have answered the musician's wish for a noiseless, interlocking on/off switch with the aid of a reed contact.

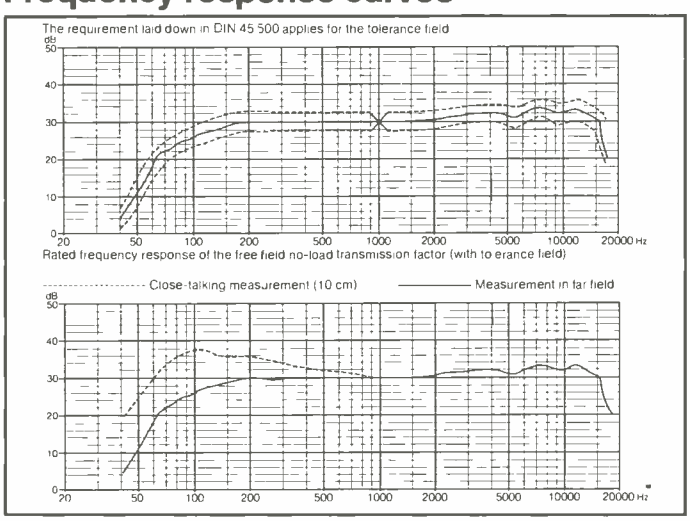
The all-metal housing of the "profipower" is in a matt-black anodised finish, giving the surface a particularly durable protection against hand perspiration. The extremely rugged, interchangeable cage surrounding the actual microphone element is of a triple-layer special steel mesh.
The "profipower" is always accompanied as standard by an adjustable and lockable quick-release clamp. The "profipower"-set is also fitted with the particularly sturdy 5 m connecting lead. Technical data will be found in the summary on pages 32 to 35.

		"Cannon" plug
		U

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 40, MZW 416-1	MZT 441, MZT 100	MZT 237, MZS 235	MZS 144, MZS 210, MZS 142
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
MZH 21		MZS 211	MZK 431 U-K

Frequency response curves



1 Musician's Microphone *studio*sound

MD 429

High-quality dynamic microphone for studio operation.
Frequency range: 50 to 16,000 Hz.
Supercardioid directional characteristic.
Exceptionally insensitive to noise.
Extremely good feedback protection.
Shock-mounted system.
XLR connection.

The MD 429 "studiosound" is a dynamic soloist microphone adapted specifically to the requirements in sound recording studios. It has been designed in accordance with wishes expressed by users in this area for a reduction in the near effect which otherwise characterises directional microphones. At the same time the pop sensitivity has been reduced to a minimum. A further quality feature is the superlative handling noise damping which has been achieved by a costly shock-mounting system.

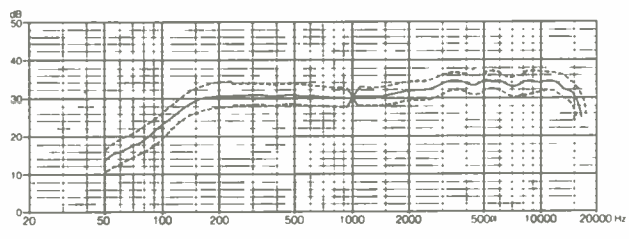
The MD 429 is fitted with a 3-pin Cannon plug connector. A quick-release clamp with thread adaptor for mounting on stands with $^{3}/_{8}$", $^{1}/_{2}$" and $^{5}/_{8}$" x 27 G thread is included as standard. The MD 429 is wired in symmetrical circuit and can thus be connected either to symmetrical or to asymmetrical equipment inputs with an impedance of no less than 1,000 ohms. The length of the connecting lead can thus also be in excess of 100 m.
The differences between the individual models and relevant technical data will be found in the summary on pages 32 to 35.

		"Cannon" plug
		U

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 40, MZW 416-1	MZT 441, MZT 100	MZT 237, MZS 235	MZS 144, MZS 210, MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
MZH 21		MZS 211	MZK 431 U-K

Frequency response curves



Rated frequency response with tolerance field

1 Musician's Microphone *profisound*

MD 427

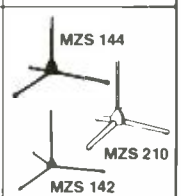
Amateur microphone with professional appearance.
Superlative transmission characteristics.
Exceptionally free of feedback.
Shock-mounted system.

The MD 427 "Profisound" is a dynamic musician's and soloist's microphone with outstanding sound characteristics. It displays very similar acoustic characteristics to its sister-product in the range, the "Profipower", and differs only slightly in appearance. The transducer system is spring-mounted to suppress handling noises. The "Profisound" can be either handheld or stand-mounted in the vicinity of loudspeaker systems without any difficulty, as the excellent directional characteristics of this microphone ensure a high degree of protection against feedback. It has been designed for rugged stage performance use and is capable of absorbing the highest sound pressures without blasting. The transducer system is protected effectively against falls or impact by a triple-layer special steel mesh cage surrounding the microphone element.

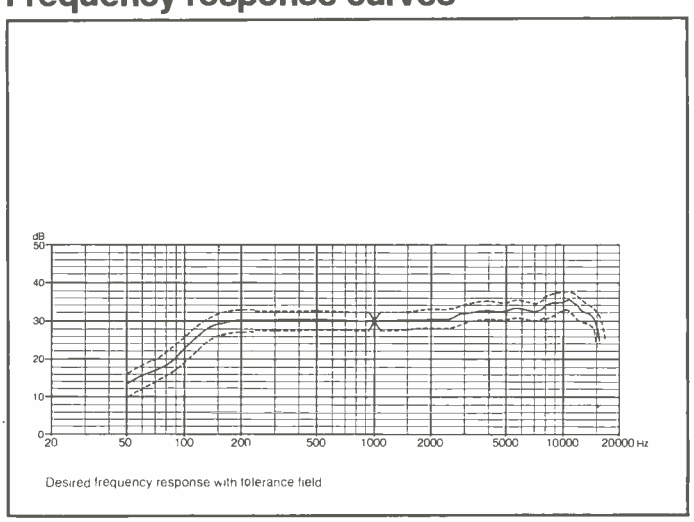
As with all directional microphones the MD 427 displays close-talking sensitivity. Experienced musicians know how to exploit this feature by varying the sound in relation to the distance between the microphone and mouth.
The MD 427 is fitted as standard with a 3-pin Cannon connector insert. The standard equipment also includes a quick-release clamp which has a thread adaptor for fastening on stands with $^{3}/_{8}$", $^{1}/_{2}$" and $^{5}/_{8}$" x 27 G threads.
The differences between the individual models will be found in the summary on pages 32 to 35.

		"Cannon" plug
		 U

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
 MZW 40 MZW 416-1	 MZT 441 MZT 100	 MZT 237 MZS 235	 MZS 144 MZS 210 MZS 142
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
MZH 21		 MZS 211	MZK 431 U-K *

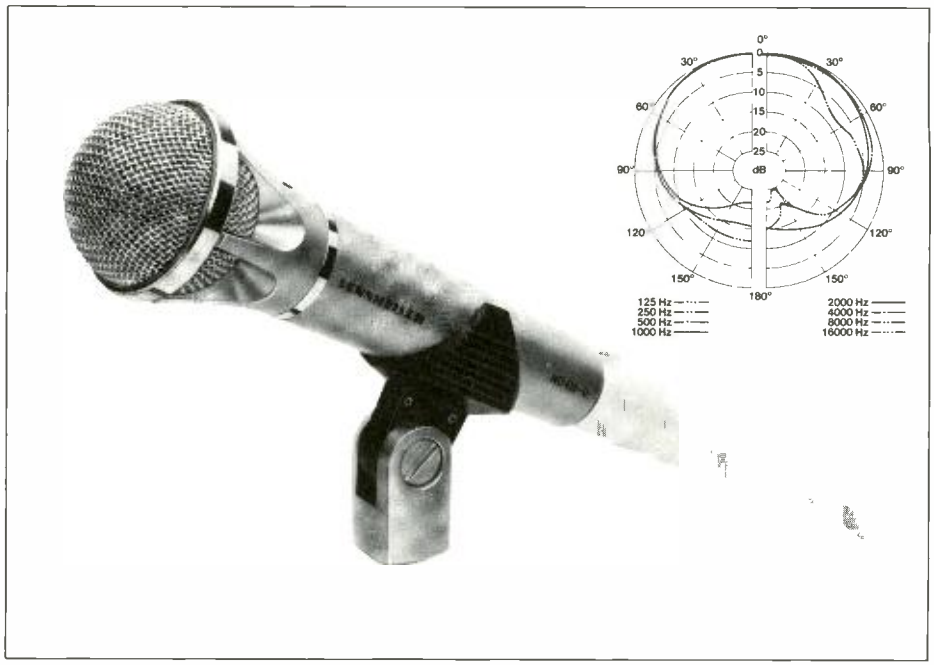
Frequency response curves



Desired frequency response with tolerance field

1 Musician's Microphone

MD 416 N · MD 416 U



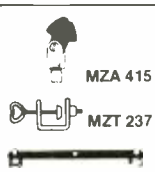
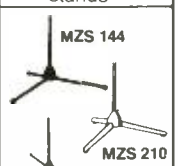
Frequency range: 50 to 15,000 Hz.
Cardioid directional pattern allowing high volume before feedback occurs.
Exceptionally insensitive to handling noise.
Built-in pop filters.
All-metal housing with shock-mounted system.
Hum compensator coil.
Quick-release clamp.
Suitable for connection to any musician's amplification system.

This medium-priced musician's microphone from Sennheiser has many of the features of the Profipower model described on page 14. For instance, the frequency response of the MD 416 is closely similar to that of the "Profipower". Its insensitivity to mechanical impact is virtually unequalled. As a special protective measure against explosive sounds and breathing noises a canary yellow pop filter attaches to the front to act in conjunction with the built-in pop filter.

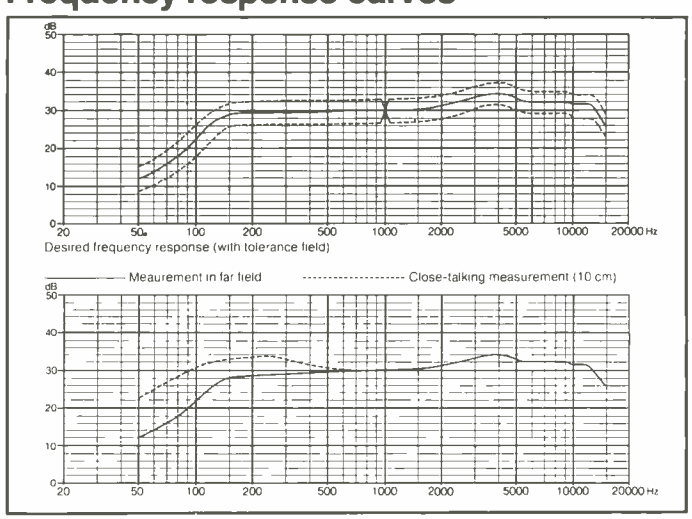
The all-metal housing of the MD 416 is machined from solid brass with a durable satin chrome finish. A strong pressure-resistant steel mesh surrounds the speech element. The shock-mounted suspension of the interior microphone system is temperature-independent and imparts the excellent handling noise damping properties. The MD 416 includes as standard the quick-release clamp and the supplementary pop filter mentioned above.
The technical data will be found in the summary on pages 32 to 35.

Small Tuchel plug		"Cannon" plug
 N		 U

Recommended accessories

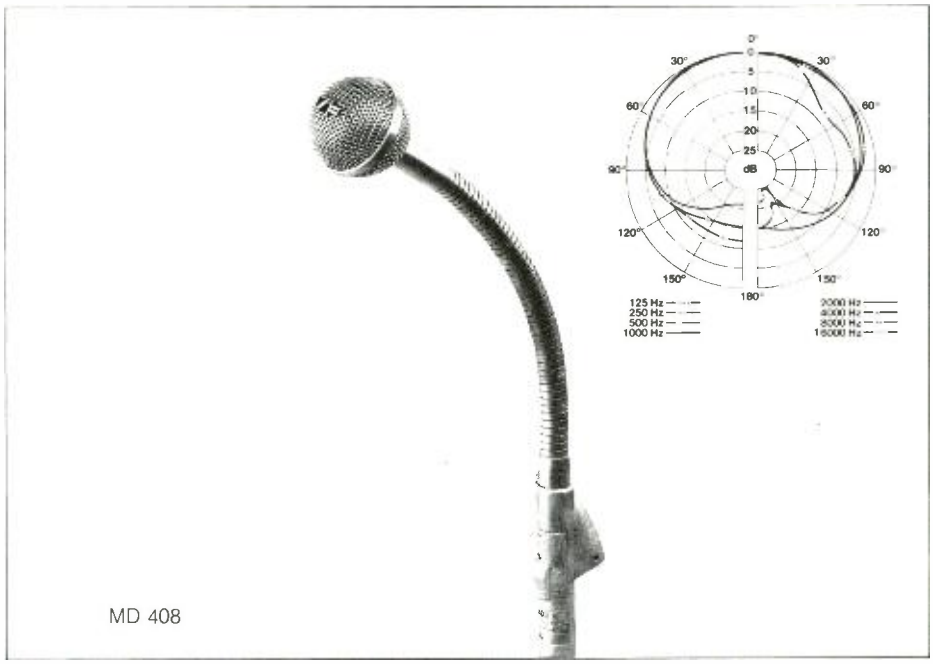
Windscreen	Desk stands	Clamps	Floor stands
 MZW 416 MZW 416-1	 MZT 441 MZT 100	 MZA 415 MZT 237 MZS 235	 MZS 144 MZS 210 MZS 142
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
MZH 21		 MZS 211	DA 5 NM-T DA 1 HL DA 7 N DA 7 NL KA 7-1 (-U) KA 7-U (-U)

Frequency response curves



1 Directional Gooseneck Microphone

MD 408 N



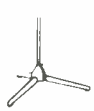
Frequency range: 50 to 15,000 Hz.
Cardioid directional characteristic.
reduces feedback.
On/Off switch.

Frequently it is necessary for microphones to be brought up close to the person speaking while at the same time leaving his or her hands free for other tasks. Here the gooseneck microphone is the ideal answer. With the MD 408, Sennheiser has created an ideal solution to this task which, through a built-in On/Off switch this, permits the microphone to be switched off during speaking pauses. At the same time the excellent directional effect of the MD 408 N ensures that only the speech of the speaker is transmitted without picking up any of the surrounding noises.

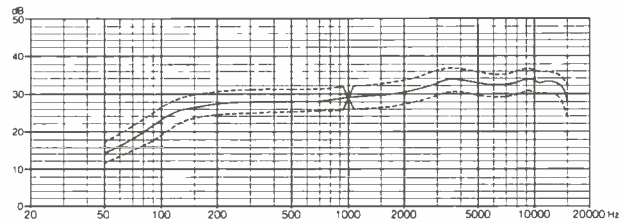
The gooseneck and acoustic inlet of the MD 408 N are of satin-chrome brass on a painted diecast metal base with a $^{3}/_{8}$" thread for mounting either on a floor stand or for fixed mounting on a desk or console. A microphone connector to DIN 41 524 specifications protrudes to the back of this base. The technical data will be found in the summary on pages 32 to 35.

Small Tuchel plug  N		

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
 MZW 411 MZW 416-1	 MZT 421  MZT 100	 MZT 237  MZS 235	 MZS 210
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		 MZS 211	DA 7 N DA 7 NL DA 1 HL

Frequency response curves



1 Directional Gooseneck Microphone

MD 908 · MD 908 N · MD 908 U

Frequency range: 50 to 15,000 Hz.
Cardioid directional characteristic.
Click-free reed switch.
Extremely insensitive to handling noise.

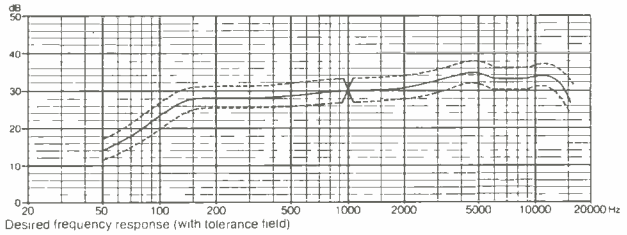
In development of the MD 908 dynamic directional microphone particular emphasis has been laid on achieving a distinctive, uniform directional characteristic. Together with the standard of insensitivity to interference and the modern design which have been achieved, this microphone is ideally suited for virtually all tasks involved in public address broadcasting. The basic MD 908 model is fitted with a single-hole mounting (10 mm bore) and 1.5 m lead with free ends. It is particularly suitable for installing at control points, speech points, speaker's podiums and in vehicles. In addition the MD 908 N gooseneck directional microphone is also available with 3-pin screw-type connection to DIN 41524 specification and the MD 908 U with 3-pin Cannon/XLR-3 connection. Both have a rugged joint coupling with interchangeable adaptors for $^{3}/_{8}$'', $^{1}/_{2}$'' and $^{5}/_{8}$'' x 27 G threaded stand mountings and are fitted with a click-free reed-type switch.
The resilient microphone capsule mounting renders all versions extremely insensitive to handling noise and they are all fitted with compensator coils against magnetic leakage fields.
The surface of the entire microphone has been finished in non-reflective black.
Technical data will be found in the summary on pages 32 to 35.

Small Tuchel plug		"Cannon" plug
 N		 U

Recommended accessories

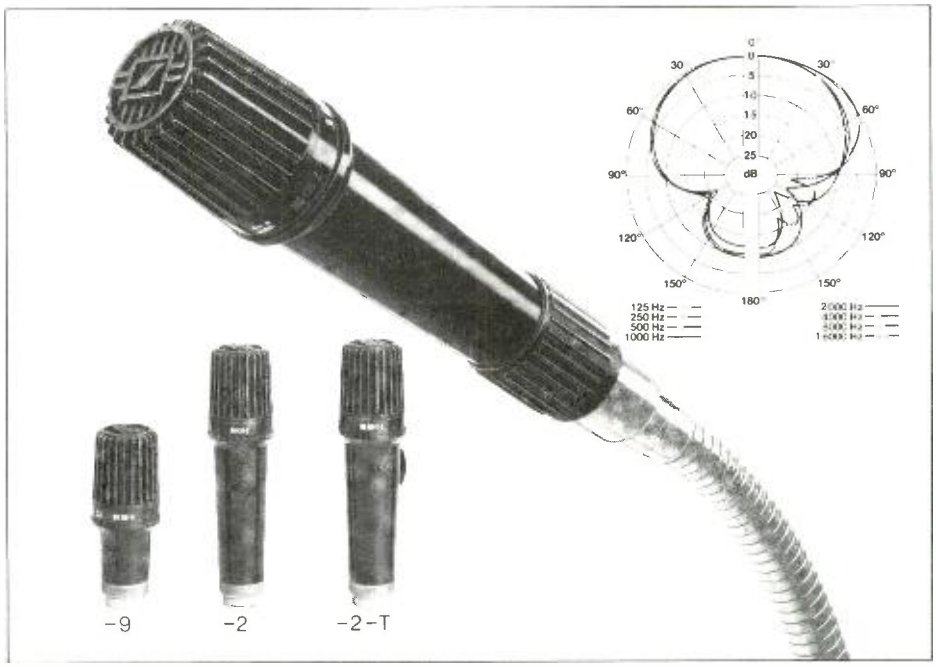
Windscreen	Desk stands	Clamps	Floor stands
 MZW 411 MZW 416-1	 MZT 441  MZT 100	 MZT 141  MZT 237  MZS 235	 MZS 144  MZS 210
Flexible necks	Adapters/ amplifiers	Boom	Basic lead type
		 MZS 211	DA 1 HL DA 7 DA 7 NL KA 7-1 KA 7-U DA 5 UK

Frequency response curves



1 PA Microphones

MD 430-2 · MD 430-2-T · MD 430-9 · MD 430-16-T · MD 430-18-T



Frequency range: 200 to 10,000 Hz.
Supercardioid directional characteristic.
Extremely low feedback.
For use in particularly noisy environments.

In all forms of public transport it is very important to ensure accurate and understandable information to the passengers. This is just as important for arrivals and departures at railway stations and airports. A particular difficulty arises owing to the unavoidable noise levels generated by the modes of transport themselves as well as generally within the terminal buildings and on railway concourses and platforms, etc. Sennheiser surveys have shown that this type of noise can be penetrated more efficiently by a frequency response shaped appropriately in the lower frequencies and with a slight rise towards the upper frequencies than is the case with a straight-line value. This is exactly the ideal frequency response path displayed by the MD 430.

In addition its extreme supercardioid directional characteristic ensures a clearly discernable emphasis on the voice of the announcer relative to surrounding noises. The MD 430 therefore offers the ideal solution for all PA announcing problems in noisy ambient conditions.
The housing of the MD 430 is of fibreglass-reinforced, impact-proof poyamide. The element is provided with an expanded wind and pop filter protection on all sices and to ensure maximum durability this microphone is available only with the large screw-type Tuchel connection coupling.
The technical data and differences between the various versions will be found in the summary on pages 32 to 35.

MD 430-2 with large Tuchel connector

MD 430-2-T with large Tuchel connector and switch

MD 430-9 shortened PA microphone with large Tuchel connector

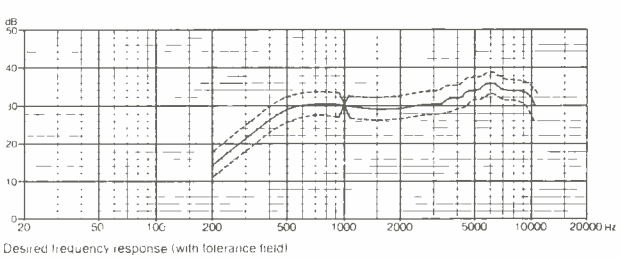
MD 430-16-T with 5-pin large Tuchel connector and speech button

MD 430-18-T with 5-pin large Tuchel connector and switch

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
MZW 30	MZT 12 (-2)	MZA 406 MZT 237 MZT 141	MZS 144 MZS 210
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
MZH 141		MZS 211	DAV 5

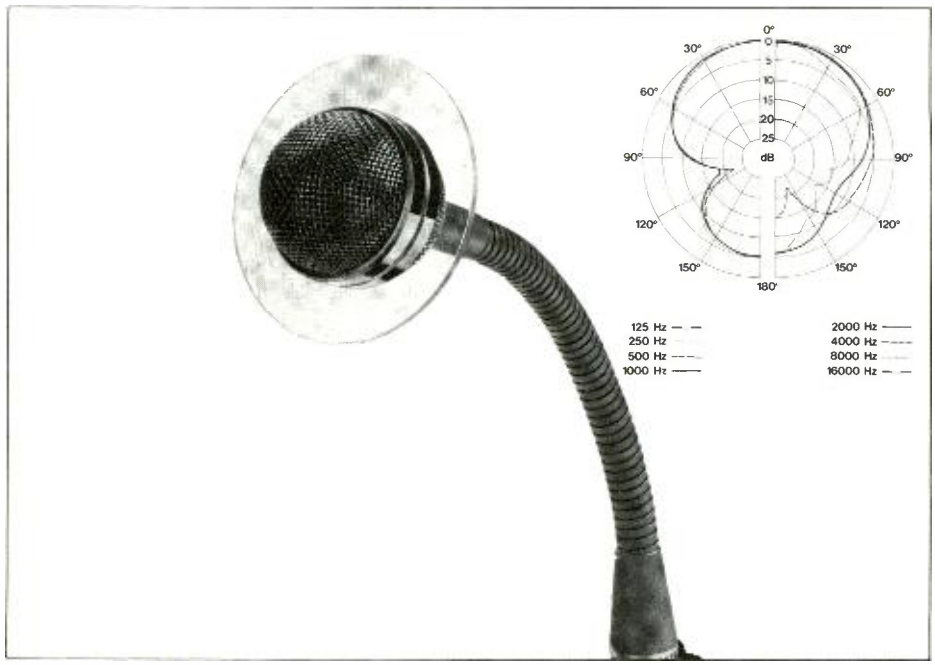
Frequency response curves



Desired frequency response (with tolerance field)

1 Directional Conference Microphones

MD 418 U · MD 418 U-4



Frequency range: 200 to 10,000 Hz.
Supercardioid directional characteristic.
High-quality recording and sound reproduction microphone system.
Rugged and reliable.

Increasingly criticism is being voiced by participants at conferences of the conventional PA systems with their penetrating and disruptive noise. Obvious preference is displayed for a totally decentralised transmission of voice at low volume. This would require a loudspeaker to be positioned in the vicinity of each participant. But why use a separate loudspeaker? The Sennheiser solution to this problem is the MD 418 U conference directional microphone. It can be used alternately as microphone and as speaker, for example all conference participants are able to use this system to engage in 2-way conversation.

The gooseneck and acoustic inlet of the MD 418 U are of brass with a satin-chrome finish. The foot at the lower end of the gooseneck carries a 3-pin Cannon connector for connecting and fastening the microphone direct to the special desk-top mount TPS 400 U. The MD 418 U-4 is also fitted with a pilot lamp in the plexiglass collar of the microphone to light up when the microphone is switched on by means of the speech button. Technical data and further differences between the various models will be found in the summary on pages 32 to 35.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands
	MZT 441 TSP 400 MZT 100	MZT 237	MZS 144 MZS 210
Flexible necks	**Adapters/ amplifiers**	**Boom**	**Basic lead type**
		MZS 211	

1 Lavalier Microphones

MD 214 N · MD 214 U-3 · MD 214-1

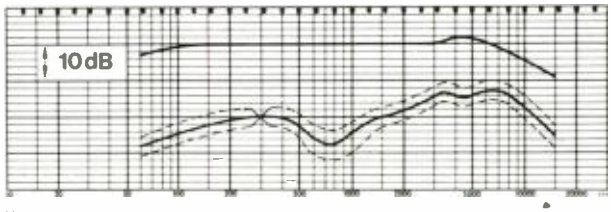
Frequency range: 60 to 15,000 Hz.
Omnidirectional characteristic.
Shock-mounted system ensures maximum possible handling noise damping.
Frequency response specific to application.

This special-purpose microphone is designed to be worn around the neck and to produce exactly the same quality of sound as a hand-held or stand-mounted microphone. This is rather more difficult than it may initially appear: the high frequencies are much attenuated by the time they reach a microphone suspended against the chest. Unfortunately the resonance of the chest tends to amplify unduly the frequencies around 700 Hz. The frequency range of the MD 214 therefore displays two deliberate corrections: the disadvantage of high frequencies has been compensated by a sharp rise above the 2,000 Hz level. Over-emphasis of frequencies around 700 Hz has been compensated by a co-ordinated lowering of the frequencies. Consequently, when worn correctly, the MD 214 produces exactly the same qualtiy as a microphone with a 3-line frequency range before the mouth of the speaker.

In addition the insensitivity of such a Lavalier microphone to friction and contact noises is also very important. For this reason the MD 214 capsule has been spring-mounted on a patented suspension system within the microphone housing. A very smooth non-reflective lacquer – important for TV broadcasting purposes – has been applied to the exterior of the metal casing.
Technical data and differences between the various models will be found in the summary on pages 32 to 35.

Small Tuchel plug		"Cannon" plug
 N		 U

Frequency response curve



Upper curve = frequency response when used as Lavalier microphone
Lower curve = frequency response in free sound field at 0

1 Probe Measuring Microphone

MD 321 N · MD 321 V

Frequency range: 40 to 20,000 Hz.
Omnidirectional characteristic.
Pinpoint sound field scanning.
Acoustic inlet insensitive to temperature.

Recent increased awareness of environmental considerations has also led to most welcome developments in the fight against noise pollution. Clear regulations have already been laid down for the permissible level of noise when working on motor vehicles and machinery. The manufacturers of such vehicles and machines are attempting to reduce existing noise levels. However, for this purpose it is first necessary to pinpoint the specific noise sources on these machine tools, engines, motors, compressors and gearboxes. The MD 321 is particularly suitable for this purpose, as its long, thin probe allows easy access to even the most difficult places. The noise is picked up through a 30 cm long tube with an outer diameter of only 8 mm. This probe tube thus does not interfere with the sound field itself. The small acoustic inlet at the leading tip of the probe is interchangeable. For practical use the signal emitted by the MD 321 can be channelled by a suitable amplifier to a headphone – for example type HD 222 – in order to allow aural assessment of the noises picked up. For technical analysis it is advisable to connect the MD 321 N to the UPM 550 universal noise level meter, which has a 1 Volt output also suitable for connecting this type of headphone for listening purposes.
The technical data will be found in the summary on pages 32 to 35.

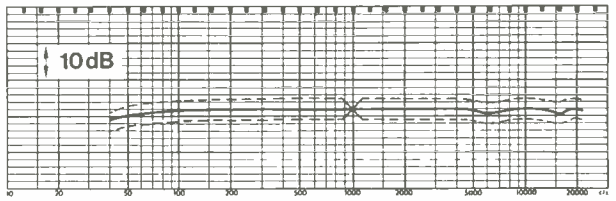
The probe measuring microphone MD 321 V is similar to the MD 321 but also incorporates an amplifier unit. This makes it possible with the aid of a headphone to hear the signal picked up by the microphone direct without interposing booster amplifiers. The amplifier is powered by an integral storage cell. A 6.3 mm jack socket can be used both to connect up a GZN 406-3 plug-in power-pack to recharge the storage cell and also for connecting up the monitor headphone. The integral power cell allows the unit to be operated continuously for up to 4 hours and the recharge period is 14 hours.

MD 321 V

Technical data

Frequency range:	40 to 20,000 Hz
Acoustic principle:	pressure receiver
Directional characteristic:	omnidirectional
Maximum sound pressure:	100 PA (134 dB)
Minimum terminating impedance:	100 ohms
Maximum output voltage into 100 ohm:	3 V
Amplification:	80 dB

Frequency response curve



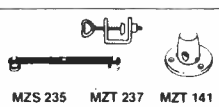
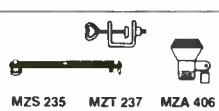
1 DYNAMIC MICROPHONES

SUMMARY OF ACCESSORIES

Dynamic microphones for professional and semi-professional application.

Microphone model	Pop and wind screens	Desk top stands
MD 441 N MD 441-2 MD 441-U	MZW 441, MZW 40	MZT 441, MZT 100
MD 421 N MD 421-2 MD 421-U	MZW 421, MZW 40	MZT 421, MZT 12 (-2), MZT 100
MD 419	MZW 421, MZW 441, MZW 40	MZT 441, MZT 100
MD 417	MZW 421, MZW 441, MZW 40	*
MD 412 LM, K	MZW 412*, MZW 416-1	*
MD 402 LM, K,U Set	MZW 30	*
MD 416 N MD 416-U	MZW 416, MZW 416-1	MZT 441, MZT 100
Dynamic directional microphones		
profipower	MZW 416-1	MZT 441, MZT 100
MD 429 studiosound		
MD 427 profisound		
MD 400 MD 400 LM MD 400 K	MZW 412, MZW 416-1	*
MD 408 N	MZW 411, MZW 416-1	MZT 421, MZT 100
MD 908-N MD 908-U MD 908-O	MZW 411, MZW 416-1	MZT 441, MZT 100
MD 418 MD 418 U MD 418-U-4		MZT 441, TSP 400-U-4, MZT 100
MD 430-2 MD 430-2-T	MZW 30	MZT 12 (-2)
Dynamic microphones with uniform omnidirectional characteristics		
MD 21 N MD 21-2	MZW 421, MZW 416-1	MZT 21, MZT 12 (-2)
MD 211 N MD 211 U	MZW 201, MZW 30	MZT 417, MZT 105-1
MD 200 MD 200 LM MD 200 K	MZW 412, MZW 416-1	*

* included as standard

Mounting hardware	Floor stands	Booms	Flexible goosenecks	Adapter amplifiers	Basic lead type
 MZA 441 MZT 237 MZS 235			 MZH 141 (-2)		DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)
 MZT 237 MZS 235 MZQ 421 MZA 421			 MZH 21 MZH 141 (-2)		DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)
 MZT 237 MZS 235			MZH 21		DA 1 HL DA 7 N DA 7 NL DAV 5 (-2) KA 7-1 (-U) KA 7-U (-U)
 MZT 237 MZS 235	 MZS 142		MZH 21		
 MZT 237 MZS 235					*
 MZT 237 MZS 235	 MZS 144				DA 5 UK *
 MZT 237 MZS 235  MZA 415	 MZS 210		MZH 21		DA 5 NM-T DA 1 HL DA 7 N DA 7 NL KA 7-1 (-U) KA 7-U (-U)
 MZT 237 MZS 235		 MZS 211	MZH 21		MZK 431 U-K *
 MZT 237 MZS 235 **Suitable for use only in conjunction with MZA 406**	**Suitable for use only in conjunction with MZA 406**				*
 MZT 237 MZS 235	 MZS 210				DA 1 HL DA 7 N DA 7 NL
 MZT 141					DA 1 HL DA 7 DA 7 NL KA 7-1 KA 7-U DA 5 UK
 MZT 237	 MZS 144				
 MZT 141 MZT 237 MZA 406			MZH 141		DAV 5
 MZS 235 MZT 237 MZT 141	 MZS 210		 MZH 21 MZH 141 (-2)		DA 1 HL DA 7 N DA 7 NL DAV 5 (-2)
 MZS 235 MZT 237 MZA 406			 MZH 142		DA 5 NM-T DA 1 HL DA 7 N DA 7 NL KA 7-1 (-U) KA 7-U (-U)
 MZT 237 MZS 235 **Suitable for use only in conjunction with MZA 406**	**Suitable for use only in conjunction with MZA 406**				*

Extention leads

see microphone and camera connection guide

Type	Frequeny range	Acoustic operating principle			Directional characteristic			Directivity at 1000 Hz (cancelling)	Free field no-load transmission factor at 1000 Hz	Electrical impedance at 1000 Hz	Minimum terminating impedance	Brilliance switch + 5 dB (at 1000 Hz) above 5 kHz	Bass control, switching in 5 stages	Bass control, switching in 2 stages	Bass control, switching in one stage
		Pressure microphone	Pressure gradient microphone	Gradient microphone with loudspeaker function	Omnidirectional	Cardioid	Supercardioid								
MD 441 N	30 ... 20000 Hz		●				●	130 / 20 dB – 3 dB	1.8 mV/Pa ± 2 dB	200 Ω	1000 Ω	●	●		
MD 441-2			●				●					●			
MD 441 U			●				●					●	●		
MD 421 N	30 ... 17000 Hz		●			●		180 / 18 dB 2 dB	2 mV/Pa ± 2.5 dB	200 Ω	200 Ω		●		
MD 421-2			●			●									
MD 421 U-4			●			●							●		
MD 419 N	30 ... 15000 Hz		●				●	120 + 10 / 22 dB	1,3 mV/Pa ± 2,5 dB	200 Ω	1000 Ω			●	
MD 419 N-T			●				●							●	
MD 419 U			●				●							●	
MD 419 U-T			●				●							●	
MD 417 LM	50 ... 15000 Hz		●				●	120 + 10 / 22 dB	2,5 mV/Pa ± 2,5 dB	800 Ω	4000 Ω				●
MD 417-6			●				●								●
MD 417 K			●				●								●
profipower	40 ... 16000 Hz		●				●	120 / 24 dB – 3 dB	1,4 mV/Pa ± 2,5 dB	250 Ω	1000 Ω				
studiosound MD 429	50 ... 16000 Hz		●				●	120 /22 dB – 3 dB	1,4 mV/Pa ± 2,5 dB	200 Ω	1000 Ω				
profisound MD 427	50 ... 16000 Hz		●				●	120 /20 dB – 3 dB	1,4 mV/Pa ± 2,5 dB	200 Ω	1000 Ω				
MD 416 N	50 ... 15000 Hz		●			●		180 / 17 dB 3 dB	1.3 mV/Pa ± 2,5 dB	200 Ω	200 Ω				
MD 416 U			●			●									
MD 211 N	30 ... 20000 Hz	●			●				1,3 mV/Pa ± 2,5 dB	200 Ω	200 Ω				
MD 211 U		●			●										
MD 21 N	40 ... 18000 Hz	●			●				1.8 mV/Pa ± 2,5 dB	200 Ω	200 Ω				
MD 21-2		●			●										
MD 412 K	50 ... 12500 Hz		●				●	120 / 20 dB 2 dB	2 mV/Pa ± 2,5 dB	800 Ω	4000 Ω				
MD 412 LM			●				●								
MD 200 LM	60 ... 13500 Hz	●			●				2,5 mV/Pa ± 3 dB	600 Ω	600 Ω				
MD 200 K		●			●										
MD 200-6		●			●										
MD 400 LM	60 ... 13500 Hz		●				●	120 + 10 / 22 dB	2,5 mV/Pa ± 3 dB	600 Ω	600 Ω				
MD 400 K			●				●								
MD 400-6			●				●								
MD 402 K	80 ... 12500 Hz		●				●	120 / 20 dB 2 dB	2,3 mV/Pa ± 3 dB	750 Ω	4000 Ω				
MD 402 LM			●				●								
MD 402 U-Set			●				●		1,2 mV/Pa ± 3 dB	200 Ω	1000 Ω				
M 408	50 ... 15000 Hz		●			●		180 / 17 dB 3 dB	1.3 mV/Pa ± 3 dB	200 Ω	200 Ω				
MD 908 N	50 ... 15000 Hz		●			●		180 / 18 dB – 3 dB	1.3 mV/Pa ± 3 dB	200 Ω	200 Ω				
MD 908 U			●			●									
MD 908			●			●									
MD 430-2	200 ... 10000 Hz		●				●	120 / 18 dB – 3 dB	1.8 mV/Pa ± 3 dB	200 Ω	200 Ω				
MD 430-2-T			●				●								
MD 430-9			●				●								
MD 430-18-T			●				●								
MD 418	200 ... 10000 Hz			●			●	110 / 17 dB 3 dB	1.8 mV/Pa 3 dB	50 Ω ± 20 %	as microphone: 200 Ω				
MD 418 U				●			●								
MD 214 N	60 ... 15000 Hz	●			●				at 300 Hz 1 mV/Pa ± 2.5 dB	at 300 Hz 200 Ω	1000 Ω				
MD 214 U-3		●			●										
MD 214-1		●			●				at 300 Hz 2 mV/Pa ± 2.5 dB	bei 300 Hz 700 Ω	4000 Ω				
MD 321 N	40 ... 20000 Hz	●			●				0.40 mV/Pa 2 dB	200 Ω	200 Ω				

Male connectors: 3-pin standard plug to DIN 41 524	Male connectors: 3-pin standard plug to DIN 41 624	Male connectors: 3-pin plug for Cannon XLR 3 coupling	Male connectors: 5-pin threaded flange plug	Male connectors: 6-pin threaded standard plug	Male connectors: 2-pin jack plug, 6.35 dia.	Male connectors: with fixed connecting lead	Male connectors: 2-pin jack plug, 3.5 dia.	Plug wiring: 1, 3 & 2 to moving coil, Plug housing to earth	Plug wiring: 2 & 3 to moving coil, 1 & plug housing to earth	Plug wiring: 1 & 3 to moving coil, 2 & plug housing to earth	Plug wiring: 1 & 2 to moving coil, 3 & plug housing to earth	Plug wiring: 2 & 4 to moving coil, Plug housing to earth, 1 & 5 to switch	Plug wiring: 4 & 1, 2, 5 to moving coil, 1, 2, 5 to earth	Connection coupling: 3-pin threaded standard coupling to DIN 41 524	Connection coupling: 3-pin threaded standard coupling to DIN 41 624	Connection coupling: 6-pin threaded standard coupling	Connection coupling: 3-pin Cannon coupling XLR-3-11 C	Connection coupling: 5-pin threaded standard coupling	Magnetic field interference factor at 50 Hz	Dimensions mm	Weight	On/Off switch	Comments
●										●				●					5 µV/5 µTesla	257 x 33 x 36	ca. 450 g		
	●										●				●					245 x 33 x 36	ca. 425 g		
		●							●								●			270 x 33 x 36	ca. 450 g		
●										●				●					5 µV/5 µTesla	203 x 46 x 49	ca. 530 g		
	●										●				●					191 x 46 x 49	ca. 500 g		
		●							●								●			215 x 46 x 49	ca. 530 g		
●										●				●					≧ 5 µV/5 µTesla	185 x 45 x 45	ca. 180 g		
●										●				●						185 x 45 x 45	ca. 180 g	●	
		●							●								●			194 x 45 x 45	ca. 180 g		
		●							●								●			194 x 45 x 45	ca. 180 g	●	
●						1,5		●						●					5 µV/5 µTesla	180 x 45 x 45	ca. 220 g		Standard coupl., non-threaded
						1,5m	●													180 x 45 x 45	ca. 220 g		
					●	1,5m														180 x 45 x 45	ca. 220 g		
			●						●◆								●◆◆		≧ 5 µV/5 µTesla	Grip: max. 31 Cage: max. 49 Length: approx. 200 mm	ca. 250 g		Built-in impact sound filter
			●						●◆								●◆◆		5 µV/5µTesla	Grip: max. 31 Cage: max. 49 Length: approx. 180 mm	ca. 220 g		
			●						●◆								●◆◆		≧ 5 µV/5µTesla		ca. 200 g		
●										●				●					≧ 5 µV/5 µTesla	Grip: max. 29 Cage: max. 49 Length: 170 mm	ca. 320 g		
		●							●								●			Grip: max. 29 Cage: 49 Length: 160 mm	ca. 320 g		
●										●				●					40 µV/5 µTesla	∅ 22 Länge: 120	ca. 125 g		
		●							●								●			∅ 22 Länge: 123	ca. 125 g		
●										●				◆●					≧ 100 µV/5 µTesla	129 x 46 x 46	ca. 280 g		
	●										●				●					143 x 46 x 46	ca. 290 g		
					●	1,5m														140 x 38 x 38	Desk-top stand: 60 g 220 g		
●						2 m		●						●						140 x 38 x 38	Desk-top stand: 60 g 220 g		Standard coupl., non-threaded
●						1,5m		●						●						∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
					●	1,5m														∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
						1,5m	●													∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
●						1,5m		●						●						∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
					●	1,5m														∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
						1,5m	●													∅ 49 + 24 Length 160	105 g		Standard coupl., non-threaded
					●	1,5m														∅ 21 x 145	with lead: approx. 190 g		
●						1,5m		●						●						∅ 21 x 145	with lead: approx. 190 g		non-threaded connection lead
		●							●								●			∅ 21 x 145	ca. 153 g		
●										●				●						Cage: dia. 40 Neck: 280	ca. 300 g	●	
●																			5 µV/5 µTesla	Cage: 45 dia. Neck + Cage: Length 440	330 g	●	
		●							●								●			Cage: 45 dia. Neck + Cage: Length 455	350 g	●	
						1,5m														Cage: 45 dia. Neck + Cage: Length 410	310 g		without plug
	●										●				●					∅ 35 Length 130	100 g		Frequency response: specially for close-talking
	●										●				●					∅ 35 Length 130	100 g	●	
	●										●				●					∅ 35 Length 90	75 g		
			●										●					●		∅ 35 Length 129	100 g	●	
		●				1,5m			●											without disc dia. 49 Length: 290	ca. 370 g		without plug
●						10 m				●				●					ca. 8 µV/5 µTesla	75 x 28 x 28	with lead: 480 g without lead: 130 g		
		●				10 m			●								●			75 x 28 x 28	with lead: 480 g without lead: 130 g		
				●		1 m							●			●			ca. 20 µV/5 µTesla	75 x 28 x 28	180 g		
●										●				●					23 µV/5 µTesla	dia. 25 Length: 440 Acoustic inlet: 8	290 g		

◆◆◆ 3-pin Switchcraft coupling ◆◆ in conjunction with desk-top stand only Binder coupling No. 09-0006-61.03 can be used ◆ 1 only to earth

2 ELECTRET CONDENSER MICROPHONES

Condenser microphones have gained a justified reputation for sound perfection to studio standards. For example, any professional will confirm that the lower diaphragm weight in this type of microphone enhances the transient response. It is hardly surprising that many an owner of medium-priced dynamic microphone nurses an ambition to buy a condenser microphone sooner or later. Until now, the high price of a really professional condenser microphone has too often rendered it a mere pipe dream.

With our range of Electret Condenser Microphones, Sennheiser has brought the advantages of the transducer principle right into the reach of the medium-priced class. These advantages include, for example, the lower diaphragm weight with resultant benefits to the transient response and handling noise sensitivity, the smaller dimensions and the uniformity of directional characteristics at different frequencies. Sennheiser has been particularly successful in emphasising the benefits of lightweight diaphragms through use of the "Back-Electret" technology. The Sennheiser range of Electret Condenser Microphones therefore slots ideally in price and range of quality features between the dynamic standard microphones and the dynamic studio microphones.

2 Modular HiFi Microphone System for Electroacoustic and Sound Film Applications
TELEMIKE K 3 N · K 3 U · K 1 · K 30 AV

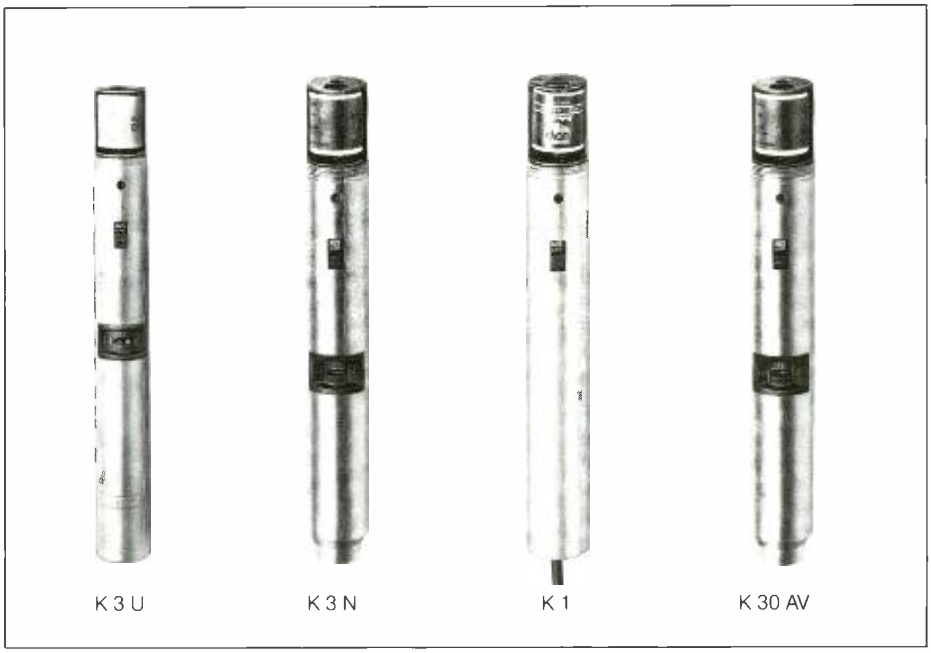
Modular System
TELEMIKE

Today many Sennheiser customers are well aware of the popularity which has been achieved by interchangeable lenses among discriminating enthusiasts for camera systems. This feature offers the particular advantage of allowing the most varied types of lens to be used on the one camera body for such diverse forms of photography as zoom, wide-angle, tele and similar. A similar diversity exists in sound recording technology and it is for this reason that a modular system has already been employed to adapt separate microphone grips and heads to high-quality condenser microphones. Sennheiser has now perfected just such a modular system within a price range more accessible to amateurs: here the audio amateur needs only one grip/powering module onto which can be screwed the microphone modules detailed on this page.

Grip/Powering Modules
K 3 N · K 3 U · K 1 · K 30 AV

Each of the microphone modules described below requires a power supply and an electronic circuit, so that the module incorporates a 5.6 Volt battery giving more than 600 hours of operation. But the audio amateur would naturally need only one of these.
What are the selection criteria? Only those persons really needing the higher audio voltage delivered by the K 1 should opt for the asymmetric output circuitry offered by this model. For all other applications the symmetric output, the plug-in type connecting lead and the three-position bass reduction switch are both useful and important. In position 1 this switch holds the hifi frequency response to below 50 Hz; in position 2 it causes a reduction by 7 db and in position 3 a reduction by 20 db at 50 Hz. The excellent low-end pickup of these microphone modules can give rise to disruptive handling, wind or impact noises under extremely unfavourable conditions, but these can be filtered out with the aid of the various switch settings without impairing human speech, the basic frequency of which is around 100 Hz.
The K 3 N differs from the K 3 U in the connector used, a small 3-pin Tuchel plug on the former and a Cannon plug on the latter. The On/Off switch is common to all three grip/powering modules and incorporates an LED to display battery condition each time the switch is operated.

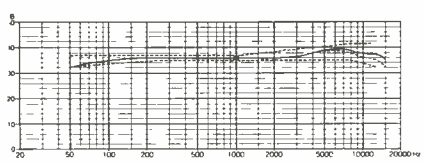
In developing the K 30 AV grip/powering module Sennheiser has taken full account of the requirements of those users wishing to use the K 3 grip/powering module also in conjunction with video cameras.
The circuit of the K 30 AV has been assembled without transformers in order to suppress interference from the deflection fields generated in the video camera. A two-stage switchable RC filter ensures effective suppression of wind and handling noises. The rolloff reduction at switch setting 2 is 7 db and at switch setting 3 it is 15 db (relative to 50 Hz). The power supply is either from the 5.6 Volt battery in the grip or by remote supply (+ 4 – + 15 V) via pin 8 of the 8-pin connecting plug. An LED shows the operational readiness when the microphone is switched on.
Relevant technical data and all differences between the various models will be found in the Summary on Pages 44 – 47.



Microphone Module
ME 20

The ominidirectional characteristic of this microphone module simplifies the conduct of interviews, as it is no longer necessary to point the mike back and forth from speaker to speaker. Its insentivity to handling noise is another useful feature. The uniform all-around pickup sensitivity permits more interesting highlighting of broadcasts owing to the selective background noise level. Moreover, where it is possible to use only one single microphone – for example for a round-table discussion in a quiet environment – this microphone head offers the ideal solution.

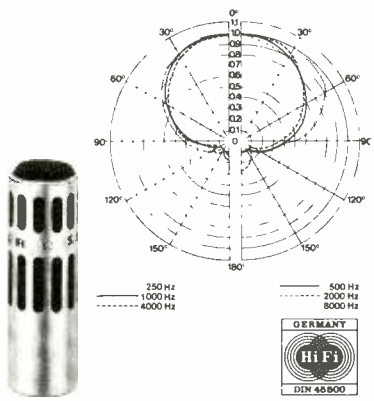
ME 20 Frequency Response Curve



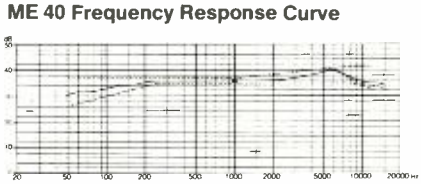
Rated frequency response with tolerance field

Microphone Module
ME 40

The cardioid directional characteristic of this microphone module is ideal for working in acoustically unfavourable surroundings tending to generate feedback and in the presence of high ambient noise and reverberation. During interviews it permits a more selective emphasis of the voice of the speaker from environmental noises. However, a degree of dexterity is required of the interviewer, who must ensure that the microphone is always aimed at the speaker. Other typical applications for this microphone include dubbing of amateur film, voice transmission on small PA systems, music transmission from amateur groups and bands and even for the teaching of elocution and language courses.



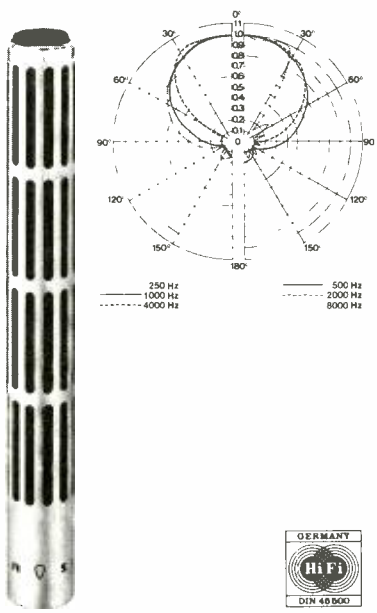
ME 40 Frequency Response Curve



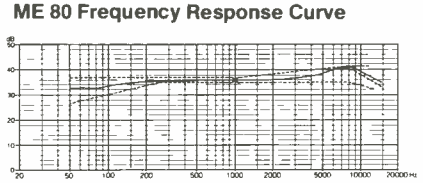
Rated frequency response with tolerance field MKE 403

Microphone Module
ME 80

Combination of a supercardioid with a shotgun characteristic at frequencies above 2000 Hz renders this microphone still more sensitive in the main direction of a acoustic intake. It is therefore suitable for use in those cases where the directivity of the ME 40 Module is no longer adequate. For example, this has led to widespread adoption of this microphone module by live sound amateur filmmakers in conjunction with the MZG 802 and MZS 802 described overleaf.
The greater directivity of this microphone module guarantees even greater protection against feedback when used in PA systems.



ME 80 Frequency Response Curve



Rated frequency response with tolerance field MKE 803

Relevant technical data will be found in the Summary on Pages 44 – 47.

Lavalier Clip on Microphones MKE 10-3 · MKE 40-3

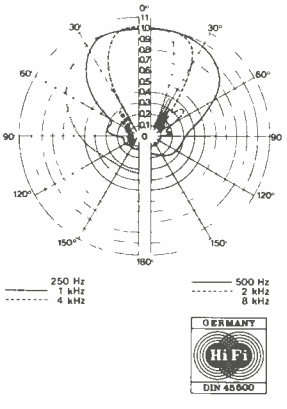
Microphone Module ME 88

Combination of a cardioid characteristic with a shotgun characteristic at frequencies above 1000 Hz renders this particular microphone ideal for recording from even greater distances than any of the modules described so far. Without any exaggeration it may be claimed that this microphone module offers the audio amateur similar scope to the facilities available to the professional using the MKH 816 URF condenser microphone. The extremely low weight of only 64 gr and expanded foam windscreen render this mike particularly suitable for use in this area. When used in conjunction with a sound camera its ability to suppress camera noises will prove particularly beneficial.

MKE 40-3

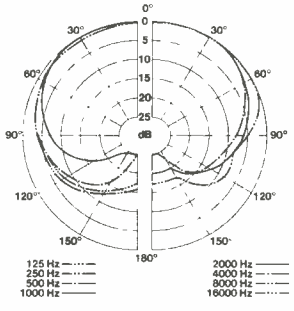
MKE 10-3

The MKE 10-3 version has been developed for the benefit of users of the Telemike system wishing to power their MKE 10 with one of the K 3 N, K 3 U or K 1 grip/powering modules. For this purpose the 3-metre connecting lead of the MKE 10-3 has a collartype screw adapter which simply screws onto the grip/powering module in place of the other mike modules to serve as a power source.

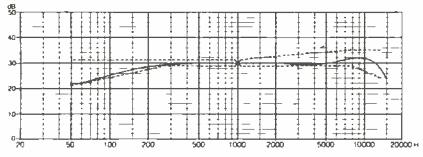


MKE 40-3

The MKE 40-3 Clip-On Microphone has been developed for owner of the Telemike system. It can be worn inconspicuously and is ideal for reporters, commentators and presenters – especially in the presence of high levels of ambient noise, which are screened by the directional characteristic of the MKE 40-3.
The connecting lead of the MKE 40-3 is 3 metres in length and fitted with a screw-type coupling collar for connecting to one of the K 3 N, K 3 U, K 1 or K 30 AV grip/powering modules as a power source.
Technical data and all differences are to be found in the Summary on Pages 44 – 47.

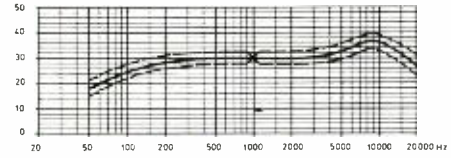


ME 88 Frequency Response Curve

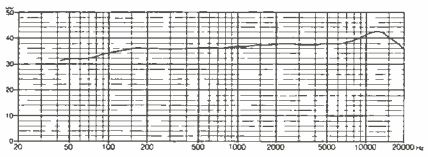


Rated frequency response with tolerance field MKE 883

MKE 10-3 Frequency Response Curve



MKE 40 Frequency Response Curve



Lavalier Clip-On Microphones

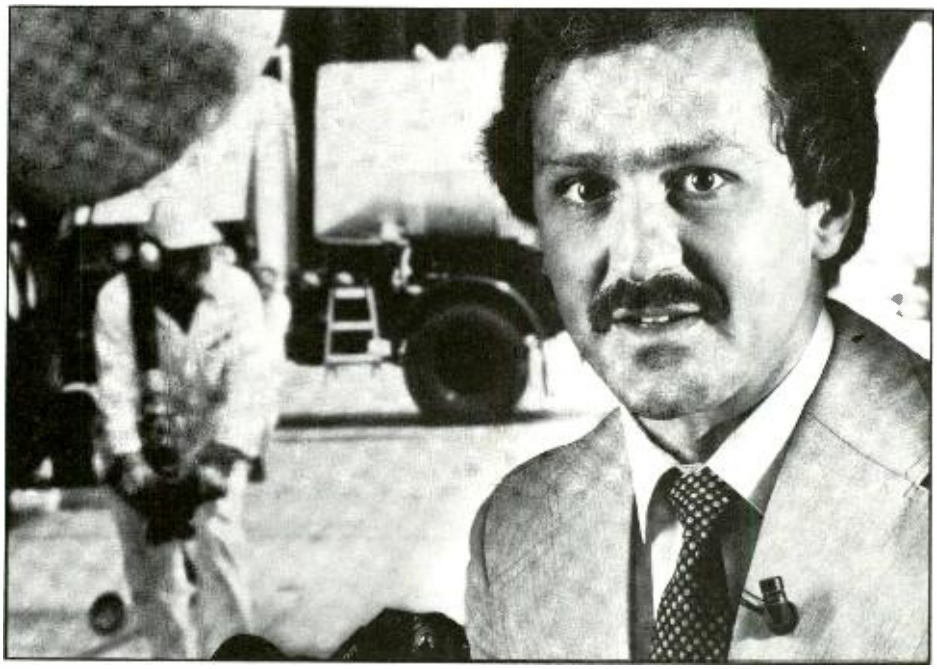
Micromike · MKE 10 · MKE 10 LM · MKE 10-6 · MKE 40 · MKE 40-6

The main advantage of clip-on microphones is that the distance between mike and speaker's mouth always remains constant irrespective of the speaker's movements. For example in the case of discussion session the level needs to be set only once.

Application of the electret technology has enabled Sennheiser to develop these small, high-quality but nevertheless economically priced Lavalier clip-on microphones capable of withstanding rugged operating conditions within their matt black chromed all-metal housing. The MKE 10 is omnidirectional and the MKE 40 cardioid. The pop protection feature integrated within these capsules can be further enhanced in difficult recording conditions with the aid of a windcreen which is also included as standard. The basic versions of the MKE 10/MKE 40 can be connected directly to the inputs of all units of equipment fitted with a centre contact to DIN 45326 specifications for powering a microphone. For all other equipment connecting the battery adapters MZA 10, MZA 10 U, MZA 10 N and the powering adapters MS 10 P and MS 10 T are available. With these it is possible to connect the MKE 10 and MKE 40 also to asymmetric medium impedance M-inputs and to symmetric low impedance N-inputs, more specifically in a Cannon variant with Tuchel-type plug connector.

2 Lavalier Clip-On Microphones

Micromike · MKE 10 LM · MKE 10-6 · MKE 40-6 · MKE 42 · MZM 10



To comply with the diversity of requirements of customers ranging from amateur to professional both microphones are offered in a variety of versions. The MKE 10 LM (3-pin standard plug connector to DIN 41524 specifications in LM circuitry) and MKE 10-6 (3.5 mm right-angled jack) are fitted with a lead with integrated battery adapter for a 1.4 Volt mercury cell (RM 675). This battery adapter is also fitted with an On/Off switch for the battery pack, which gives a service life in excess of 600 hours. The 3-metre connecting lead permits direct connection of both microphones to live sound cameras. The -3 version is available for using both microphones with the powering grips K 3 N, K 3 U and K 30 AV in the Telemike System (see Page 39).

The MKE 42 is available for fixed installation on stages, lecterns, etc. and can be coupled with a tubular base (400 mm length) to form an attractive, unobtrusive unit.
All MKE microphones can be connected to the battery adapter (see Technical Data) with the aid of an extension lead. A windscreen is also included as standard with the MKE 10 and MKE 40 Lavalier clip-on microphones. You will find the technical data and all differences between the versions in the Summary on Pages 44 to 47.

Magnetic Mount MZM 10
This small, lightweight magnetic disc with a diameter of only 32 mm is worn on a neck cord and positioned below the garments wherever the microphone is to be positioned. The powerful magnetic force of the four magnets ensures a secure hold also through thick fabrics. This ensures that the attachable microphone is always held in the ideal acoustic position, i. e. centred about 25 cm below the mouth.
The microphones described on this page are intended for wired operation. Slightly modified versions for wireless operation in conjunction with the Mikroport system will be found on Page 42.

MKE 42

MZM 10

2 Microphones for RF Transmission

MKE 10 · MKE 10 R · MKE 10-1 · MKE 40 R · MKE 40-1 R

Microphones for Wireless Transmission

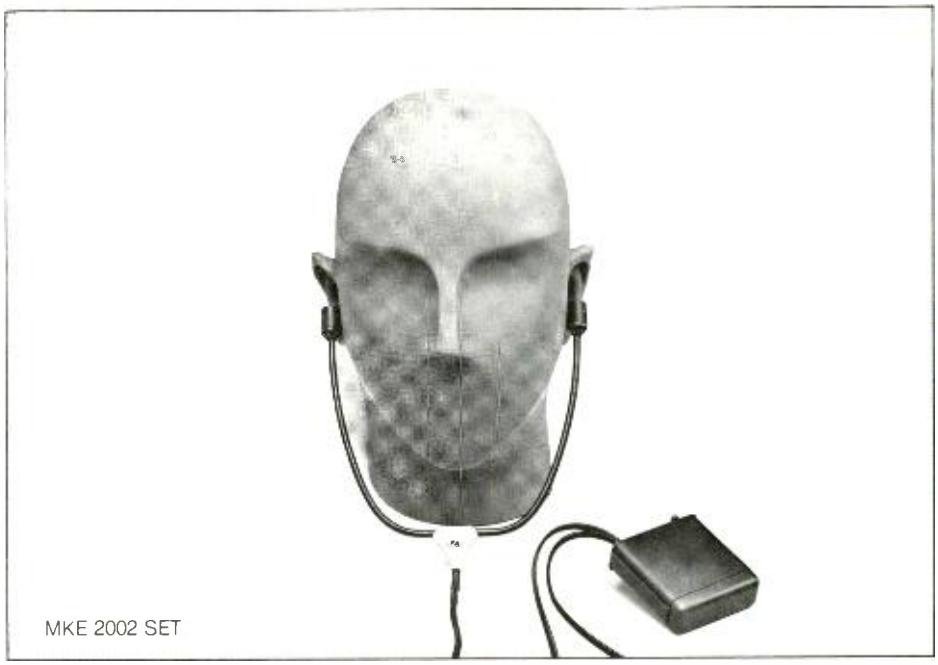
We have reported overleaf on hardwired applications for the Lavalier clip-on/attachable microphones. For many individual purposes, however, it is important for the person wearing this type of microphone to be able to move about freely without being hampered by leads. You will find the wireless Mikroport compenents for this purpose in Group 6. The MKE 10 R and MKE 40 R microphones are designed for connection to the Mikroport transmitters SK 1010 and SK 1012, where the power is supplied direct from the transmitter. The clip-on or attachable microphone is clipped to the lapel, tie, dress neckline or positioned on the clothing in conjunction with the magnetic holder MZM 10.
The MKE 10-1 or MKE 40-1-R microphones are designed for use in conjunction with the SK 1008 Mikroport transmitter and fitted with a special connecting lead for this purpose. Our service technicals will make the minor modification to the Mikroport SK 1007 transmitter necessary for operation of the MKE 10-1 or MKE 40-1 R.
Relevant technical data and all differences between the various versions will be found in the Summary on Pages 44 – 47.

Plug-In Microphone Heads MKE 2010 · MKE 4010 · MKE 2012 · MKE 4012

Plug-in microphone heads are needed to operate the Mikroport transmitters SK 1010 and SK 1012, which will always be necessary where the Mikroport transmitter is used as a hand-held microphone or as a transmitter worn suspended from the neck and is to be handed easily on to the next speaker. The MKE 2010 and 4010 Plug-In microphones are available for use in conjunction with the SK 1010 Transmitter and the MKE 2012 and MKE 4012 microphones for the SK 1012 Transmitter. The MKE 2010 and MKE 2012 display an omnidirectional characteristic and thus pick up the sound virtually uniformly from all sides. Their low sensitivity to handling noise frequently permits these microphones also to be used for children with impaired hearing in their scholling as well as in applications where no loudspeakers are being used in the same room. If there is any danger of acoustic feedback owing to use of speakers, the MKE 4010 microphones (SK 1010) or MKE 4012 (SK 1012) are used, owing to their cardioid characteristic, directed toward the mouth of the person speaking whose voice is then emphasised by contrast with the ambient noise.
Relevant technical data and differences between the various versions will be found in the Summary on Pages 44 – 47.

2 Binaural Stereo Microphones

MKE 2002 · MKE 2002 Set



MKE 2002 SET

Frequency response: 40 to 20,000 Hz.
Outstanding recording quality with electret condenser microphone systems.
For binaural recordings on your own head or using an artificial head.
Complete with battery power supply, one battery charge lasting over 300 operating hours.

When the RIAS radio station in Berlin broadcast the first binaural drama "Demolition" on 3rd September 1973 and Sennheiser Electronic simultaneously launched its first binaural demo record, the broadcasting world suddenly pricked up its ears. Since that time binaural stereo has found a permanent place in stereo transmissions broadcast by radio stations throughout Western Germany. The spatial brilliance and remarkable acoustic perfection in directivity and distance render this system far superior to any other technology in its field known today.
At the same time, however, dummy head stereo is quite simple: the binaural MKE 2002 stereo microphone is inserted in the ears of a dummy head or, even better, in your own ears, positioning the two condenser microphones precisely at the point where the sound enters the ear. At this point the sound incorporates all information needed for perception of direction and distance, which you then record on a tape recorder. When listening to this recording at any later date using open headphones, as described on pages 54 to 60, the listener experiences exactly the same sensations as if being present at the original event. Sennheiser offers four demo discs to anyone interested in dummy head or binaural stereo *

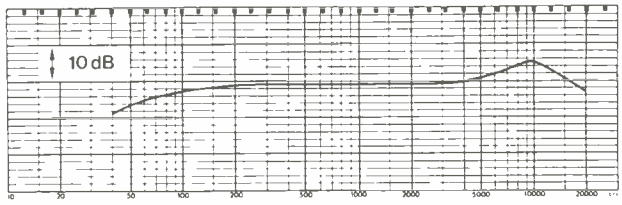
The MKE 2002 binaural stereo headphone is used by amateur tape recording enthusiasts for recording plays and concert music, by language and music teachers, by industrial and commercial companies to record important meetings, by recording companies for recording long-play albums and by broadcasting stations for documentaries and radio drama.
The two high-quality condenser microphones are mounted on the tips of an extremely lighweight stethoscope. This stethoscope is linked by a lightweight steel lead to the power pack containing the 9 V battery cell (IEC 6 F 22), an on/off switch and a pushbutton to operate the battery level display. The 3-metre connecting lead is connected permanently to this powerpack and plugged into a tape recorder. This lead carries a standard plug connector to DIN 41525 specifications wired to permit the MKE 2002 binaural stereo headset to be connected to virtually all conventional stereo tape recorders and stereo cassette recorders. The operating manual is accompanied by a connection handbook to facilitate location of the correct wiring layout.

The MKE 2002 binaural stereo microphone is designed basically to be worn on the human head. For those wishing to use the MKE 2002 in conjunction with a dummy head it is necessary to order the MKE 2002 set version as this is the only one comprising the additional dummy head and necessary carrying case as standard. For outdoor recordings, even in only limited wind conditions, the windscreen MZW 2002 is also recommended. Relevant technical data will be found in the Summary on pages 44 to 47.

* Dummy head stereo
Dummy head stereo II
Simeon 2 research
Direct cutting in dummy head stereo

Recommended accessory:
MZW 2002 windscreen

Frequency response curves



Rated frequency response (with tolerance field) measured at 1 m
Each microphone is accompanied by the original test certificate as measured at 50 to 20 000 Hz

Microphones with remote power supply

Windscreen	Microphones	Clamps and quick-release clips	Shockmounts, desk and floor stands	Leads	Powerpacks	Filter, transformers	Lead adapters, receivers
MZW 10 MZW 42	MKE 10-1 MKE 40-1 R				SK 1008-3		see microphone and camera connection handbook
MZW 10*	MKE 10 MKE 10 R			MZV 10	MZA 10 MZA 10 N MZA 10-U SK 1010 SK 1012		
MZW 42	MKE 40 R						
MZW 1010	MKE 2010 MKE 4010 MKE 2012 MKE 4012				SK 1010 SK 1012		
MZW 10*	MKE 10-3 MKE 40-3 + K 3 N			KA 7 U	MZN 16 P 48	MZF 802 U	
MZW 42	MKE 10-3 MKE 40-3 + K 3 U						
MZW 30 MZW 201	K 3 N + ME 20 K 3 N + ME 40	MZA 406 MZQ 415 MZG 415 MZG 802	MZS 144 MZS 211 MZS 210 MZS 415 MZS 802 MZT 105-1 MZT 237 MZT 441	KA 1 KA 7	MZN 16 P 48	MZF 802 TM 514 X	
	K 3 U + ME 20 K 3 U + ME 40			KA 7 U	MZN 16 P 48-U	MZF 802 U	
MZW 415	K 3 N + ME 80			KA 1 KA 7	MZN 16 P 48	MZF 802 TM 514 X	
	K 3 U + ME 80			KA 7 U	MZN 16 P 48-U	MZF 802 U	
*	K 3 N + ME 88			KA 1 KA 7	MZN 16 P 48	MZF 802 TM 514 X	
	K 3 U + ME 88			KA 7 U	MZN 16 P 48-U	MZF 802 U	
MZW 10*	MKE 10-3 + K 30 AV						
MZW 42	MKE 40 + K 30 AV						
MZW 30 MZW 201	K 30 AV + ME 20 K 30 AV + ME 40	MZA 406 MZQ 415	MZS 144 MZS 211 MZS 210 MZS 415	MZV 10			
MZW 415	K 30 AV + ME 80	MZG 415	MZS 802 MZT 105-1	MZK 30 AV			
*	K 30 AV + ME 88	MZG 802	MZT 237 MZT 441				

* included as standard

Microphones with built-in battery supply

Windscreen	Microphones	Clamps and quick-release clips	Shockmounts, desk and floor stands	Leads	Powerpacks	Filter, transformers	Lead adapters, recejvers
MZW 42 *	MKE 40-6						see microphone and camera connection handbook
MZW 10 *	MKE 10 LM MKE 10-6						
	MKE 10-3 + K 3 N			KA 1 KA 7		MZF 802 TM 514 X	
	MKE 10-3 + 3 K U MKE 103 U			KA 7 U		MZF 802 U	
MZW 42	MKE 40-3 + K 3 N			KA 1 KA 7		MZF 802 TM 514 X	
	MKE 40-3 + K 3 U			KA 7		MZF 802 U	
MZW 30 MZW 201	MKE 201 ME 20 + K 1 ME 40 + K 1	MZA 406 MZQ 415 MZG 415 MZG 802	MZS 144 MZS 211 MZS 210 MZS 415 MZS 802 MZT 105-1 MZT 237 MZT 144				
	K 3 N + ME 20 MKE 403 N K 3 N + ME 40			KA 1 KA 7	see microphones **with** remote power supply	MZF 802 TM 514 X	
	K 3 U + ME 20 K 3 U + ME 40			KA 7-1* KA 7 U		MZF 802 U	
MZW 415	K 1 + ME 80						
	K 3 N + ME 80			KA 1 KA 7	see microphones **with** remote power supply	MZF 802 TM 514 X	
	K 3 U + ME 80			KA 7-1* KA 7 U		MZF 802 U	
*	K 3 N + ME 88			KA 1 KA 7		MZF 802 TM 514 X	
	K 3 U + ME 88			KA 7-1* KA 7 U		MZF 802 U	
MZW 10	MKE 10-3 + K 30 AV			MZV 10 MZK 30 AV MZK 802 MZK 802-1			
MZW 42	MKE 40-3 + K 30 AV						
MZW 30 MZW 201	K 30 AV + ME 20 K 30 AV + ME 40						
MZW 415	K 30 AV + ME 80						
*	K 30 AV + ME 88						
MZW 2002	MKE 2002		MZS 144 MZS 210				

* included as standard

ELECTRET CONDENSER MICROPHONES · TECHNICAL DATA

Model	Frequency response	Acoustic operating mode				Directional characteristic					Open circuit transmission factor	Electrical impedance	Minimum load impedance	Signal-to-noise ratio to DIN 45 590
		Pressure transducer	Pressure gradient transducer	Pressure gradient interference transducer	Interference transducer	Omnidirectional	Supercardioid	Supercardioid/lobe	Cardioid/lobe	Cardioid				
ME 20 + K 1	50 Hz ... 15 kHz	●				●					2 mV/µbar ≙ 20 mV/Pa ± 2,5 dB	ca. 15 kΩ	1,5 kΩ	≧ 64 dB
ME 20 + K 3 N		●				●					0,3 mV/µbar ≙ 3 mV/Pa ± 2,5 dB	120 Ω at switch setting I	300 Ω at switch setting I	ca. 64 dB
ME 20 + K 3 U		●				●								
ME 20 + K 30 AV		●				●					0,55 mV/µbar ≙ 5,5 mV/Pa ± 2,5 dB	600 Ω	600 Ω	ca. 66 dB
ME 40 + K 1	50 Hz ... 15 kHz		●				●				2 mV/µbar ≙ 20 mV/Pa ± 2,5 dB	ca. 15 kΩ	1,5 kΩ	≧ 64 dB
ME 40 + K 3 N			●				●				0,3 mV/µbar 3 mV/Pa ± 2,5 dB	140 Ω at switch setting I	300 Ω at switch setting I	ca. 64 dB
ME 40 + K 3 U			●				●							
ME 40 + K 30 AV			●				●				0,55 mV/µbar 5,5 mV/Pa ± 2,5 dB	600 Ω	600 Ω	ca. 66 dB
ME 80 + K 1	50 Hz ... 15 kHz			●				●			3 mV/µbar ≙ 30 mV/Pa ± 2,5 dB	ca. 15 kΩ	1,5 kΩ	≧ 70 dB
ME 80 + K 3 N				●				●			0,5 mV/µbar ≙ 5 mV/Pa ± 2,5 dB	130 Ω at switch setting I	300 Ω at switch setting I	ca. 70 dB
ME 80 + K 3 U				●				●						
ME 80 + K 30 AV				●				●			0,8 mV/µbar 8 mV/Pa ± 2,5 dB	600 Ω	600 Ω	
ME 88 + K 3 N	50 Hz ... 15 kHz				●				●		0,5 mV/µbar 5 mV/Pa ± 2,5 dB	130 Ω at switch setting I	300 Ω at switch setting I	ca. 70 dB
ME 88 + K 3 U					●				●					
ME 88 + K 30 AV					●				●		0,8 mV/µbar 8 mV/Pa ± 2,5 dB	600 Ω	600 Ω	
MKE 10	50 Hz ... 20 kHz	●				●					1 mV/µbar 10 mV/Pa ± 2,5 dB	ca. 1 kΩ	4,7 kΩ	ca. 64 dB
MKE 10-R		●				●								≧ 64 dB
MKE 10-1		●				●								ca. 64 dB
MKE 10-3 + K 3 N		●				●					0,15 mV/µbar ≙ 1,5 mV/Pa ± 2,5 dB	ca. 110 Ω	300 Ω at switch setting I	
MKE 10-3 + K 3 U		●				●								
MKE 10-3 + K 30 AV		●				●					0,25 mV/µbar ≙ 2,5 mV/Pa ± 2,5 dB	600 Ω	600 Ω	ca. 60 dB
MKE 10-6		●				●					0,35 mV/µbar ≙ 3,5 mV/Pa ± 2,5 dB	ca. 1 kΩ	2 kΩ	ca. 62 dB
MKE 10 LM		●				●								
MKE 40-R	50 Hz ... 20 kHz		●							●	1 mV/µbar ≙ 10 mV/Pa ± 2,5 dB	ca. 1 kΩ	4,7 kΩ	≧ 64 dB
MKE 40-1-R			●							●				
MKE 40-3 + K 3 N			●							●	0,15 mV/µbar 1,5 mV/Pa ± 2,5 dB	ca. 110 Ω	300 Ω at switch setting I	ca. 64 dB
MKE 40-3 + K 3 U			●							●				
MKE 40-3 + K 30 AV			●							●	0,25 mV/µbar ≙ 2,5 mV/Pa ± 2,5 dB	600 Ω	600 Ω	ca. 60 dB
MKE 40-6			●							●	0,35 mV/µbar ≙ 3,5 mV/Pa ± 2,5 dB	ca. 1 kΩ	2 kΩ	ca. 62 dB
MKE 40-4			●							●	1 mV/µbar ≙ 10 mV/Pa ± 2,5 dB		4,7 kΩ	ca. 64 dB
MKE 2010	50 Hz ... 15 kHz	●				●					0,3 mV/µbar ≙ 3 mV/Pa ± 2,5 dB	ca. 1 kΩ	65 kΩ	ca. 60 dB
MKE 4010			●							●				
MKE 2012	50 Hz ... 15 kHz	●				●					1,1 mV/µbar ≙ 11 mV/Pa ± 2,5 dB	ca. 1 kΩ	4,7 kΩ	≧ 64 dB
MKE 4012			●							●				
MKE 2002 SM wiring	40 ... 20 000 Hz	●				●					SM – 1 mV/µbar 10 mV/Pa ± 3 dB	ca. 1 kΩ	4,7 kΩ	ca. 64 dB
MKE 2002 SL wiring		●				●					0,3 mV/µbar ≙ 3 mV/Pa ± 3 dB		1, kΩ	
		Powering adaptor for microphones with plugs to DIN 45 326												
MS 10 PU		Powering adaptor for phantom powering									Transmission ratio, transmitter 5 : 1	ca. 85 Ω	500 Ω	
MS 10 TU		Powering adaptor for sound wire supply									Insertion loss 2 dB	ca. 20 Ω	100 Ω	
MZA 10		Battery adaptor									Insertion loss 0 dB	ca. 1kΩ	4,7 kΩ	
MZA 10 N		Battery adaptor									Transmission ratio, transmitter 5 : 1	ca. 200 Ω	16 Ω	
MZA 10 U		Battery adaptor												

Plug connectors								Connector plug wiring								Power supply								Dimensions	Weight	Surface finish	Comments
threaded to DIN 45 322, without pins 5 and 6	threaded to DIN 45 326, (without pins 4 and 5 *)	3-pin standard plug to DIN 41 524, Mas 30 S	3-pin threaded standard plug to DIN 41 524	5-pin standard plug to DIN 41 524, Mas 50 S	Right-angled jack 3.5 mm	3-pin Cannon plug XLR-3		1 = audio, 2 = earth, 8 = + V_D (6 and 7 bridged *)	1 + 2 = earth, 4 = audio, 3 = – V_D	3 = left, 5 = right, 2 = earth	1 = left, 4 = right, 2 = earth	asymmetric 1 ≙ 3 to audio, 2 to earth (1 audio, 2 earth)	1 to audio, 2 to housing, 3 to audio to DIN 45 594	1 to housing, 2 to audio, 3 to audio	1 bridged with 3, 1, 3 and 2 to audio, plug housing to earth	pin 1 = earth, pin 2 = audio	Battery 5.6 V, e. g. Mallory PX 23	Battery 1.5 V button cell 675 IEC MR 07, e. g. UCAR EP 675 E 9 V, IEC 6 F 22, e. g. Mallory MN-1604 *	Via pin 8 to DIN 45 594 + 4 to + 15 V	Via pin 3	Phantom supply to DIN 45 596 for 12 V and 48 V without switchover	Sound wire supply to DIN 45 595	Battery service life				
		●										●					●							19/22 dia. 177 long	ca. 120 g	Satin nickel	
			●										●				●							19/22 dia. 186 long	ca. 160 g		✶
						●								●			●							19/22 dia. 201 long	ca. 170 g		✶
	●							●									●			●				19/22 dia. 186 long	ca. 110 g		
		●										●					●							19/22 dia. 177 long	ca. 120 g	Satin nickel	
			●										●				●							19/22 dia. 186 long	ca. 160 g		✶
						●								●			●						≙ 600 h	19/22 dia. 201 long	ca. 170 g		✶
	●							●									●			●				19/22 dia. 186 long	ca. 110 g		
												●					●							19/22 dia. 291 long	ca. 155 g	Satin nickel	
													●				●							19/22 dia. 298 long	ca. 195 g		✶
						●								●			●							19/22 dia. 313 long	ca. 205 g		✶
	●							●									●			●				19/22 dia. 298 long	ca. 145 g		
			●										●				●							19/40 dia. 688 long	ca. 145 g	Satin nickel and aluminium, black anodised	✶
						●								●			●							19/40 dia. 703 long	ca. 155 g		✶
	●							●									●			●				19/40 dia. 688 long	ca. 140 g		
	✶							✶										●							ca. 45 g	matt-black chromed	
	✶							✶										●									
●									●										●					18 dia. 9 mm high			
			●									●					●								ca. 125 g		✶
						●								●			●								ca. 135 g		✶
	●																●								ca. 120 g		
				●											●			●					≙ 600 h		ca. 53 g		
		●														●		●							ca. 61 g		
	✶							✶											●						ca. 50 g	matt-black chromed	
●									●											●							
			●									●					●								ca. 160 g		✶
						●								●			●							12 dia. 30 long	ca. 140 g		✶
	●							●									●			●			≙ 600 h		ca. 125 g		
				●											●			●							ca. 58 g		
	✶							✶											●					5/12 dia. 200/400/600			
	✶							✶											●					21,8 dia. ca. 27 long	ca. 18 g	matt-black chromed	Microphone impedance matched to the input impedance of SK 1010
	✶							✶											●								
	✶							✶											●					21,8 dia. ca. 27 long	ca. 18 g	matt-black chromed	
	✶							✶											●								
				●							●						✶						≙ 300 h		ca. 195 g		Channel deviation in transmission range = 3 dB
				●							●						✶										
						●								●						●					ca. 98 g	matt-black chromed	
						●								●							●			18,8 dia. 103 long	ca. 88 g		
			●							✶							✶							L x W x H			
			●										●				✶						≙ 600 h	68 x 22 x 81	ca. 120 g	black	
						●								●			✶							68 x 22 x 81	ca. 130 g	black	
															●		✶							68 x 22 x 78	ca. 130 g	black	

* Recommended load impedance greater than 5 kΩ at switch setting II and III

3 Sennheiser MKH Range

RF CONDENSER MICROPHONES

The Sennheiser condenser microphones in using RF circuitry are market leaders in so far as their electro-acoustical characteristics are concerned. They have also distinguished themselves by their remarkable resistance to climatic conditions over many years of intensive use.

RF circuitry
By contrast with condenser microphones with a conventional dc-bias, the RF circuitry in the capsule of a condenser microphone produces a low impedance in the actual condenser transducer element. The RF voltage across the transducer is only in the order of 10 Volt instead of the high dc-bias voltage which is otherwise necessary, this voltage being generated by a noiseless oscillator (8 MHz). The high operational reliability of the microphone is attributable to the capsule impedance.
The principle of voltage matching is used in connecting up both the Sennheiser condenser microphones and dynamic microphones. There are no adverse level or frequency response effects between microphone and connected equipment owing to the extremely low-impedance circuits.

Power supply
Sennheiser offers condenser microphones for both standardised powering systems, the audio conductor and phantom powering. Both powering modes permit the use of the same connecting leads as in the operational dynamic studio microphones. The power can be supplied by battery adaptor or mains powerpack.

The 12 V audio conductor or AB powering offers a simple method for the use of battery adaptors. Mains powerpacks are generally available for the 48 V phantom technology. In studio use the powering voltage is made available primarily from the centralised mixing board.
AB voltage sources must be switched off when dynamic microphones are connected up. Normally phantom voltage sources can remain switched on where dynamic microphones are connected. Sennheiser use the method laid down in standard specifications for identifying the powering mode: for AB powered microphones the suffix T is used and for phantompowered microphones the suffix P in conjunction with the powering voltage.
The MKH 110 and MKH 101-1 low frequency microphones deviate from the standard specification, these being powered asymmetrically via special mains powerpack units.

Interference protection
Sennheiser condenser microphones display very high output levels, which reduces the danger of interference feedback by more than 20 dB by comparison with dynamic microphones. Consequently it is not necessary to impose any specially high symmetrical requirements for the connecting leads.
The microphones are also provided with generously proportioned RF filters to prevent RF voltage leaking into the microphone lead and at the same time providing further protection for the microphones against RF voltages. Consequently such special measures as double screening of the leads and RF-proof fittings are unnecessary even under the most difficult operating conditions.

Sennheiser condenser microphones for RF use do not incorporate any audio frequency transformers and are thus also insensitive to magnetic interference fields.
Owing to the extremely lightweight diaphragms the microphones are also highly insensitive to acceleration, i. e. handling noise. In most cases it is thus possible to use the condenser microphones without any spring shockmounts.

Sennheiser MKH range
The MKH abbreviation designates all Sennheiser radiofrequency condenser microphones. The standardised designations for powering using T or P 48 have already been outlined above. In addition the suffix letter U denotes a "Cannon" plug connector. The suffix -3 denotes matt-black finish by comparison with the basic finish in satin nickel. The complete Summary will be found in the following listing.

SENNHEISER MKH RANGE

Pt. No.	Model
1560	**MKH 406 T**
1561	**MKH 406 T-3**
1562	**MKH 406 T U**
1563	**MKH 406 T U-3**
1188	**MKH 406 P 48**
1512	**MKH 406 P 48-3**
1189	**MKH 406 P 48 U**
1513	**MKH 406 P 48 U-3**

Pt. No.	Model
1564	**MKH 416 T**
1565	**MKH 416 T-3**
1566	**MKH 416 T U**
1567	**MKH 416 T U-3**
1186	**MKH 416 P 48**
1510	**MKH 416 P 48-3**
1187	**MKH 416 P 48 U**
1511	**MKH 416 P 48 U-3**

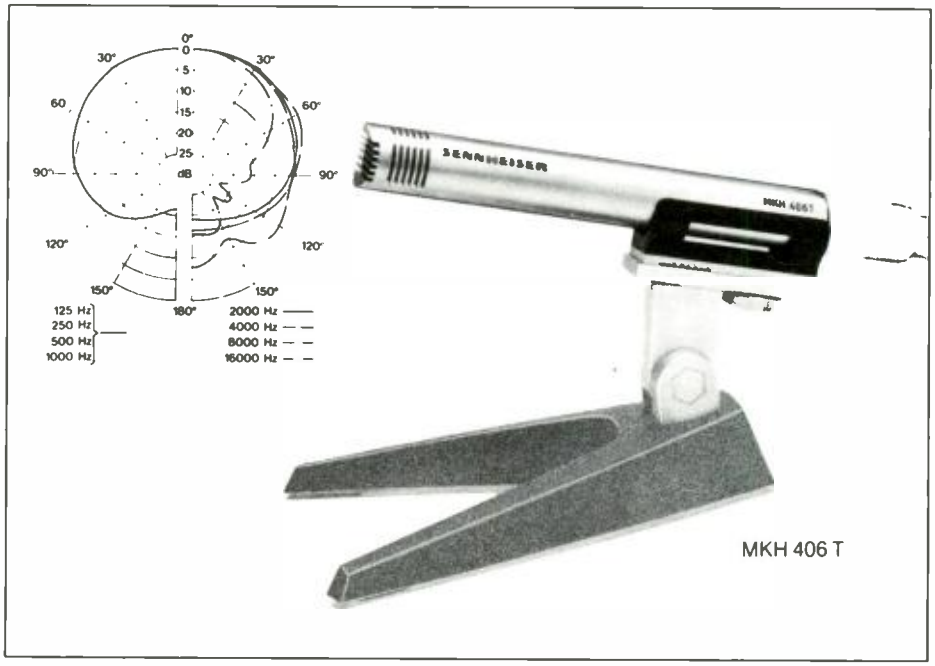
Pt. No.	Model
1568	**MKH 816 T**
1569	**MKH 816 T-3**
1570	**MKH 816 T U**
1571	**MKH 816 T U-3**
1190	**MKH 816 P 48**
1514	**MKH 816 P 48-3**
1191	**MKH 816 P 48 U**
1515	**MKH 816 P 48 U-3**

Pt. No.	Model
1593	**MKH 106 T**
1650	**MKH 106 T-3**
1604	**MKH 106 T U**
1649	**MKH 106 T U-3**
1285	**MKH 106 P 48**
1806	**MKH 106 P 48-3**
1286	**MKH 106 P 48 U**
1807	**MKH 106 P 48 U-3**

Pt. No.	Model
	MKH 124
	MKH 125 T
	MKH 125 T-3
	MKH 125 T U
	MKH 125 T U-3
	MKH 126 P 48
	MKH 126 P 48-3
	MKH 126 P 48 U
	MKH 126 P 48-3
0372	**MKH 110**
0373	**MKH 110-1**

Explanation:
Model number without suffix = nickel finish with small Tuchel plug connector
U = nickel finish with Cannon plug -3 = matt black with small Tuchel connector plug
U-3 = matt-black with Cannon plug connector

3 Directional Studio Microphones MKH 406 · MKH 406 T · MKH 406 T-3 · MKH 406 TU · MKH 406 TU-3 · MKH 406 P 48 · MKH 406 P 48-3 · MKH 406 P 48 U · MKH 406 P 48 U-3



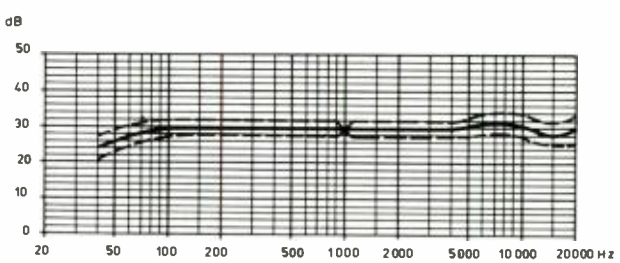
Frequency response: 40 to 20,000 Hz.
Directional characteristic: Cardioid
Anti-feedback design.
High signal-to-noise ratio.
Rugged and extremely resistant to adverse climatic conditions.
Low sensitivity to handling noise.

The MKH 406 range of condenser microphones are pressure gradient designs with cardioid characteristics. The extremely lightweight, gold-vapour-metallised plastic diaphragms react instantaneously to transients. With this signal fidelity the MKH 406 gives the sound engineer the possibility of creating high-quality recordings of speech and music in the studio. Additionally the extreme resistance to moisture and temperature fluctuations renders this microphone ideal for mobile transmission work, where the low handling noise sensitivity offers an additional advantage. The extremely low level of self-generated noise, combined with the advantageous acceptance angle of a cardioid microphone produces excellent results when recording low level signals. The RF circuitry ensures maximum immunity to electrical and magnetic interference. The superlative properties of the MKH 406 render it highly popular both in the professional sector and for use by the discriminating amateur tape recordist.
Technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

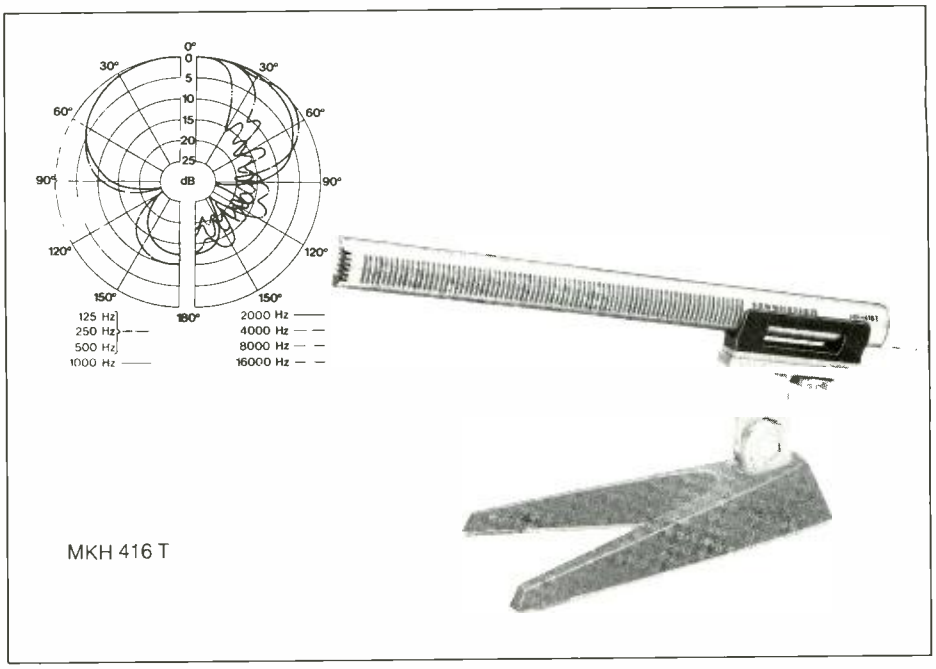
Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 30 MZW 201	MZT 441 MZT 100	MZS 415 MZQ 415 MZG 415 MZT 237 MZB 415	MZS 142 MZS 144 MZS 210 MZS 211 MZH 142 MZH 21 MZS 235
Powerpacks		**Filters/adapters/ amplifiers**	**Connection cables**
MZN 16 P 48 MZN 16 T MZA 15 MZA 15 U MZN 6 MZN 16 P 48-U MZN 16 T U		MZF 15 MZF 15 U KAT 15-2 KAT 15-3	KA 1 KA 7 KA 7 U

Frequency response curves



Rated frequency response (with tolerance field) MKH 406 T, measuring distance 1 m
Each microphone is accompanied by the original test certificate measured from 50 to 20,000 Hz

3 Directional Studio Microphones MKH 416 · MKH 416 T · MKH 416 T-3 · MKH 416 TU · MKH 416 T U-3 · MKH 416 P 48 · MKH 416 P 48-3 · MKH 416 P 48 U · MKH 416 P 48 U-3



MKH 416 T

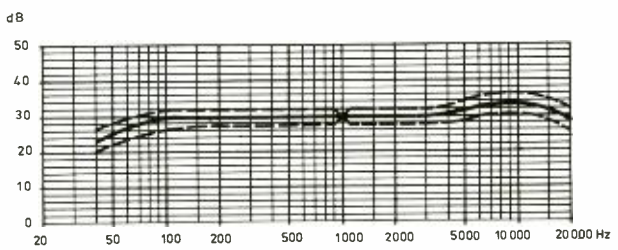
Frequency response: 40 to 20,000 Hz.
Directional characteristic: supercardioid.
Particularly low feedback.
Low proximity effect.
High signal-to-noise ratio.
Rugged and extremely resistant to adverse climatic conditions.
Built-in pop filter.

The MKH 416 range of condenser microphones combine the characteristics of pressure gradient and interference microphones. The directional pattern is supercardioid for the lower and medium frequencies and adopts a lobar configuration at frequencies above 2,000 Hz. This directional characteristic eliminates indirect sound to guarantee perfect recording even at long distances. However, this microphone is equally popular for close-range distances, as its small proximity effect prevents the tendency to boom in the low frequency ranges. The enhanced directivity by comparison with a pure cardioid microphone offers the user greater benefits under even the most difficult acoustic conditions, so that this microphone has proved particularly popular for use in chat shows, for example. Reporters value the MKH 416 for its low sensitivity to popping and its mechanical stability. Increased directivity combined with extension of the directional tube have been limited to a figure which keeps the microphone sufficiently light in weight to enable it to be suspended for lengthy periods on a fish pole, for example for filming work.
Relevant technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

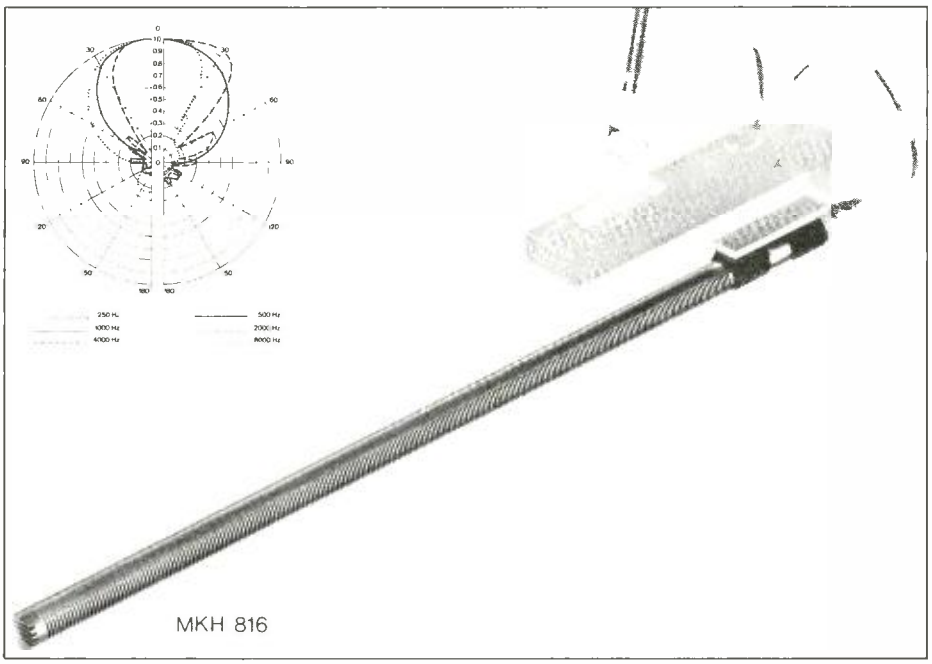
Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 415	MZT 441 MZT 100	MZS 415 MZQ 415 MZB 415 MZG 415 MZP 815 MZT 237	MZS 142 MZS 144 MZS 210 MZS 211 MZH 21 MZS 235
Powerpacks		Filters/adapters/ amplifiers	Connection cables
MZA 15 MZN 6 MZN 16 P 48 MZN 16 T MZA 15 U MZN 16 P 48-U MZN 16 T U		MZF 15 MZF 15 U KAT 15-2 KAT 15-3	KA 1 KA 7 KA 7 U

Frequency response curves



Rated frequency response (with tolerance field) MKH 416 P 48 measuring distance 1 m
Each microphone is accompanied by the original test certificate measured from 50 to 20,000 Hz

3 Directional Studio Microphones MKH 816 · MKH 816 T · MKH 816 T-3 · MKH 816 TU · MKH 816 T U-3 · MKH 816 P 48 · MKH 816 P 48-3 · MKH 816 P 48 U · MKH 816 P 48 U-3



Frequency response: 40 to 20,000 Hz.
Directional characteristic: lobar.
Extremely insensitive to feedback.
High signal-to-noise ratio.
Rugged and extremely resistant to adverse climatic conditions.
For long recording distances.

The MKH 816 range consists of shotgun microphones offering an extremely high standard of directivity. By combining the interference and gradient principles it has been possible to achieve a basically lobar directional characteristic. The MKH 816 picks up primarily the direct sound and therefore reduces echo and interference, even at a considerable distance from the sound source, to a far higher degree than, for example, cardioid microphones. This microphone is used particularly in the TV and film industry where it is essential for the microphone to remain out of shot or where the microphone placement might impair freedom of movement of the cameras.

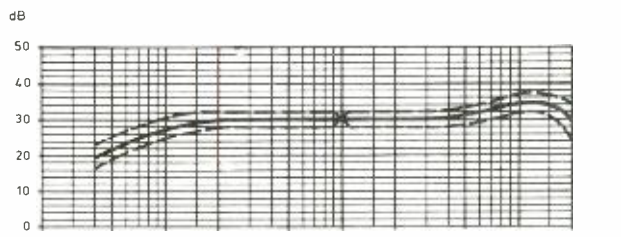
Special measures have been incorporated to ensure that the MKH 816 is impervious to wind and pop noises. Nevertheless it is advisable to use the windscreens available in the standard range of accessories for outdoor recording or in fast panning situations. The low level of selfnoise of RF condenser microphones is particularly important for picking up low sound levels at long distances. It is for this reason that this microphone has frequently resolved the most difficult recording problems while still producing the highest sound quality. Typical applications for the MKH 816 are in sports braodcasting, studio recordings, outdoor filming and in the recording of animal noises.

Relevant technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

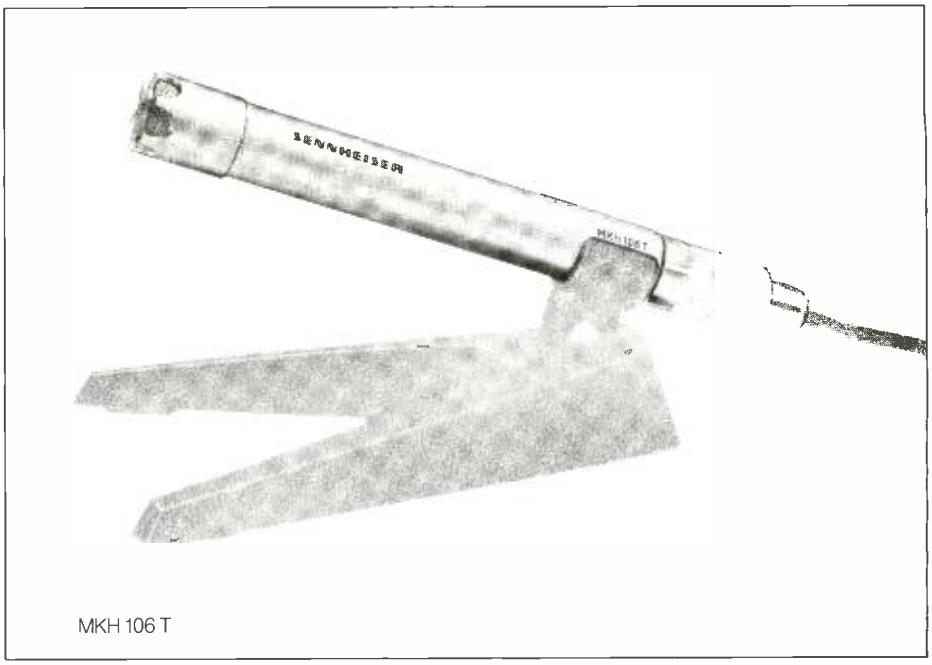
Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 815 MZW 816		MZS 815 MZS 816 MZB 415 MZP 816	MZS 144 MZS 210 MZS 211
Powerpacks		**Filters/adapters/ amplifiers**	**Connection cables**
MZN 16 P 48 MZN 16 T MZA 15 MZA 15 U MZN 6 MZN 16 P 48-U MZN 16 T U		MZF 15 MZF 15 U KAT 15-2 KAT 15-3	KA 1 KA 7 KA 7 U

Frequency response curves



Rated frequency response (with tolerance field) MKH 816 P 48, measuring distance 1 m
Each microphone is accompanied by the original test certificate measured from 50 to 20,000 Hz

3 **Studio Microphones** MKH 106 · MKH 106 T · MKH 106 T-3 · MKH 106 TU · MKH 106 T U-3 · MKH 106 P 48 · MKH 106 P 48-3 · MKH 106 P 48 U · MKH 106 P 48 U-3



MKH 106 T

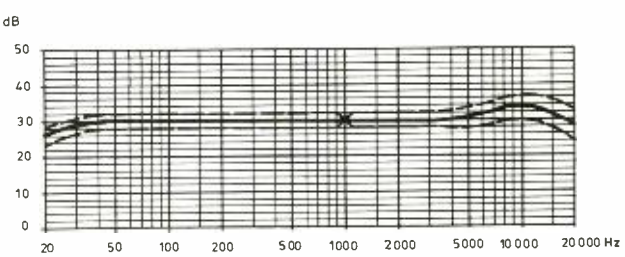
Frequency response: 20 to 20,000 Hz.
Omnidirectional characteristic.
Low self-noise level.
Suitable for high sound pressures.
Rugged and extremely resistant to adverse climatic conditions.
Extremely insensitive to handling noises.

The MKH 106 range of condenser microphones incorporate pressure transducers to produce an omnidirectional characteristic. This ensures that the tonal quality and volume are totally independent of the microphone positioning relative to the sound source. Moreover there is no change whatsoever in the tonal quality relative to the distance from the sound source. The same applies to the immediate vicinity, where the low pop sensitivity eliminates any problems in close miking. The MKH 106 is ideal for use wherever it is not necessary to reduce noise interference and also where there is no danger of acoustic feedback. These microphones are particularly popular for use in recording and broadcasting studios and offer a number of important advantages, including a high standard of reliability, even in unfavourable temperature and humidity conditions, low self-noise levels, high dynamic range and maximum immunity to electrical and magnetic fields. The short length combined with small diameter of all MKH microphone renders them ideal for use whenever unobtrusiveness is essential.
Relevant technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

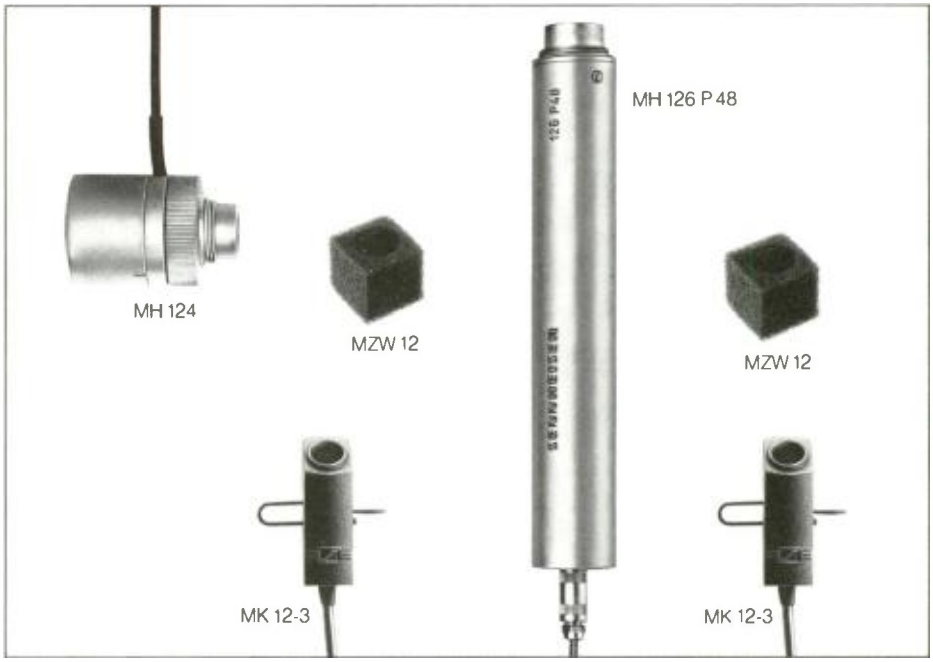
Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 30 MZW 201	MZT 441 MZT 105-1 MZT 417	MZS 415 MZQ 415 MZG 415 MZT 237 MZA 406	MZS 144 MZS 210 MZS 211 MZH 21 MZS 235
Powerpacks		Filters/adapters/ amplifiers	Connection cables
MZA 15 MZN 6 MZN 16 T MZN 16 P 48 MZA 15 U MZN 16 T U MZN 16 P 48-U		MZF 15 MZF 15 U KAT 15-2 KAT 15-3	KA 1 KA 7 KA 7 U

Frequency response curves



Rated frequency response (with tolerance field) MKH 106 T, measuring distance 1 m
Each microphone is accompanied by the original test certificate measured from 40 to 20.000 Hz.

3 Clip-on Microphone Systems MK 12-3 · MH 124 · MH 124 T · MH 125 T-3 · MH 125 T U · MH 125 T U-3 · MH 126 P 48 · MH 126 P 48 U ·



Frequency response: 40 to 20,000 Hz.
Omnidirectional characteristic.
Rugged and extremely resistant to adverse climatic conditions.
"Invisible" clip-on microphone.
Insensitive to handling noise.

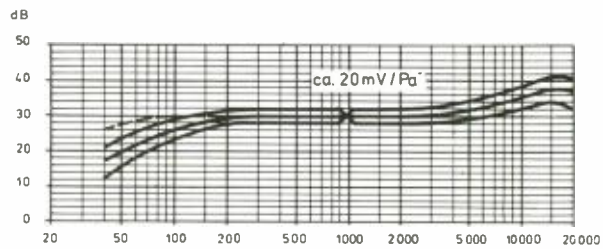
The small MK 12 microphone with a diaphragm diameter of only 6 mm is particularly suitable for use in TV studios, for MCs and quiz masters, for stage actors and for use in interviewing. The acoustic characteristics are ideal for the stringent requirements imposed in studio operation. In accordance with its intended application the microphone is of the pressure transducer type and is insensitive to handling noise. The frequency response rises continuously above 1,000 Hz to compensate for the loss of highter frequencies caused by the manner in which the microphone is worn.

The MK 12 can be connected directly with the SK 1007 studio pocket transmitter. For hardwired operation the MK 12 is coupled with the MH 125 or 126 amplifier and can thus be powered from A - B or phantom powering sources. The link between the MK 12 and amplifier can be extended to 20 m. The MK 12 also includes a small expanded foam windscreen as standard.
Relevant technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 12 **Included as standard**			
Powerpacks		Filters/adapters/ amplifiers	Connection cables
MZN 16 P 48 **MZN 16 T** **MZN 16 P 48-U** **MZN 16 T U**	**MZA 15** **MZA 15 U**	**MZF 15** **MZF 15 U**	**KA 1** **KA 7** **KA 7 U**

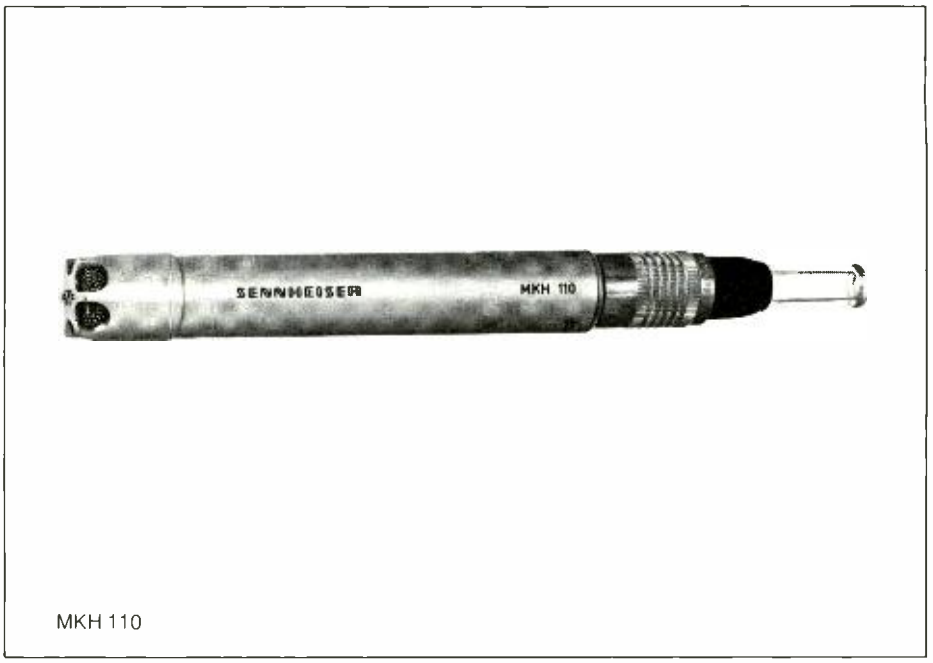
Frequency response curves



Rated frequency response (with tolerance field)
Each microphone is accompanied by the original test certificate measured from 40 to 20 000 Hz

3 Low-Frequency Microphones

MKH 110 · MKH 110-1

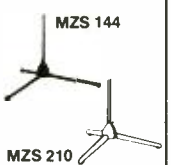


MKH 110

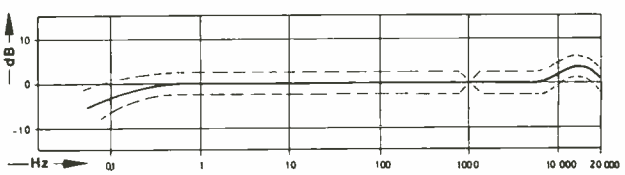
Frequency response:
MKH 110: 1 to 20,000 Hz.
MKH 110-1: 0.1 to 20,000 Hz.
Omnidirectional characteristic.
For audible sound and infrasound.
Extremely wide temperature range.
Rugged and extremely resistant to adverse climatic conditions.
Low sonsitivity to handling noise.

The MKH 110 and MKH 110-1 low-frequency microphones are pressure transducers for special applications. The radio frequency principle permits the frequency range to be extended down to almost 0 Hz. In accordance with special user requirements the frequency scope of the MKH 110 has been designed to range from 1 Hz to 20,000 Hz and of the MKH 110-1 from 0.1 Hz to 20,000 Hz. To match the applications the MKH 110-1 has been reduced in sensitivity by 20 dB by comparison with the MKH 110. In conjunction with this, however, the modulation limit has been increased from 20 Pa to 500 Pa. Owing to the special requirements imposed in outdoor use, for example in aeronautical research and for infrasonic recording, both microphones have been designed for use at extremely low temperatures. These microphones have been developed for special applications and are not recommended for recording of speech or music, because transmission could be impaired through infrasonic disturbance. By contrast with the microphones used in studio work, the powering via special mains powerpacks is also asymmetric. When connecting amplifiers in series care must be taken to ensure that the low-frequency output carries dc voltage. This dc can be blocked to the next unit in accordance with the requirements down to the lower limiting frequency.
Relevant technical data will be found in the Summary on pages 56 to 59.

Recommended accessories

Windscreen	Desk stands	Clamps	Floor stands/ boom
MZW 30  **MZW 201** 	**MZT 105-1**  **MZT 441** 	**MZS 415**  **MZQ 415**  **MZG 415**  **MZT 237**  **MZA 406** 	**MZS 144**  **MZS 210** **MZS 235**
Power-packs	Filters/adapters/ amplifiers	Connection cables	
MZN 16 X 		**KA 1** **KA 7**	**MZS 211**  **MZH 142** **MZH 21**

Frequency response curves



Rated frequency response (with tolerance field) MKH 110-1
Each microphone is accompanied by the original test certificate measured from 40 to 20,000 Hz.
In the 0.1 to 40 Hz area the frequency response is monitored by a pistonphone measurement

Microphones for A-B powering to DIN 45595

Windscreen	Microphones	Desk stands	Mounting Hardware	Stands, booms, brackets	Powering leads	Powering devices, power-packs	Filters, adapters, amplifiers	Connecting leads
MZW 30	MKH 106 T MKH 106 T-U	MZT 417	MZA 406 MZS 415	MZS 142				
MZW 201	MKH 406 T-3 MKH 406 T U	MZT 105-1	MZQ 415 MZG 415	MZS 144		MZA 15 MZA 15 U	MZF 15 MZF 15 U	
MZW 426 MZW 415	MKH 416 T MKH 416 T U	MZT 105-1	MZH 142 MZH 21 MZT 441 MZT 237	MZS 210 MZS 211	KA 1 KA 7	MZN 16 T	KAT 15-2 KAT 15-3	see Microphone Connection Handbook
MZW 816 MZW 815	MKH 816 T MKH 816 T U		MZS 416 MZP 816 MZS 816 MZS 815 MZG 415 MZP 816	MZB 415	KA 7 U	MZN 16 T U MZN 6		
MZW 12 *	MK 12-3 + MH 125 T MZV 125 MK 12-3 + MH 125 T-U MZV 125							

Microphones for microport transmitters

* Included as standard

Windscreen	Microphones	Desk stands	Mounting Hardware
MZW 12 *	MK 12-3		SK 1007
	MK 12-3	MH 124	SK 1008

Microphones for phantom powering 48 V to DIN 45 596 specifications

Windscreen	Microphones	Desk stands	Mounting Hardware	Stands, booms, brackets	Powering leads	Powering devices, power-packs	Filters, adapters, amplifiers	Connecting leads
MZW 30	MKH 106 P 48 MKH 106 P 48 U	MZT 417	MZS 415 MZQ 415 MZG 415 MZA 406 MZT 441	MZS 142 MZS 144 MZS 210 MZS 211 MZB 415	KA 1 KA 7 KA 7 U	MZN 16 P 48 MZN 16 P 48 U	MZF 15 MZF 15 U	see Microphone Connection Handbook
MZW 201	MKH 406 P 48 MKH 406 P 48 U	MZT 105-1						
MZW 426 MZW 415	MKH 416 P 48 MKH 416 P 48 U	MZT 105-1	MZT 237 MZH 142 MZH 21					
MZW 816 MZW 815	MKH 816 P 48 MKH 816 P 48 U		MZS 416 MZP 816 MZS 816 MZS 815 MZG 415 MZP 816					
MZW 12*	MK 12-3 + MH 126 P 48 MK 12-3 + MH 126 P 48 U							

Special microphones

* Included as standard

Windscreen	Microphones	Desk stands	Mounting Hardware	Stands, booms, brackets	Powering leads	Powering devices, powerpacks	Filters, adapters, amplifiers	Connecting leads
MZW 30 MZW 201	MKH 110 MKH 110-1	MZT 104 MZT 105-1		MZS 142 MZS 144 MZS 210 MZS 211	KA 1 KA 7	MZN 16 X		KA 1 KA 7

RF CONDENSER MICROPHONES · TECHNICAL DATA

Model	Frequency response	Acoustical mode of operation				Directional characteristic				Open circuit output voltage	Electrical impedance at 1000 Hz	Minimum load impedance	S/N ratio (DIN 45 590)	Overload level	Powering			Supply voltage	Supply current	Temperature range	
		Pressure transducer	Pressure gradient transducer	Pressure gradient/ interference transducer		Omnidirectional	Cardioid	Super cardioid	Club shaped						AB (DIN 45 595)	Unbalanced	Phantom (DIN 45 596)			– 10 C bis + 70 C	– 35 C bis + 70 C
MKH 406 T	40 . . . 20 000 Hz		●				●			20 mV/Pa ± 1 dB 2 mV/µbar ± 1 dB	ca. 8 Ω balanced ground free	600 Ω (200 Ω up to 20 Pa)	72 dB	30 Pa ≙ 124 dB	●			12 V ± 2 V	ca. 6 mA	●	
MKH 406 T-3			●				●								●					●	
MKH 406 TU			●				●													●	
MKH 406 TU-3			●				●								●					●	
MKH 406 P 48	40 . . . 20 000 Hz		●				●			20 mV/Pa ± 1 dB 2 mV/µbar ± 1 dB	ca. 10 Ω balanced	1 kΩ (200 Ω up to 30 Pa)	ca. 72 dB	ca. 75 Pa ≙ 132 dB			●	48 V ± 12 V	ca. 2 mA	●	
MKH 406 P 48-3			●				●										●			●	
MKH 406 P 48 U			●				●										●			●	
MKH 406 P 48 U-3			●				●										●			●	
MKH 416 T	40 . . . 20 000 Hz			●				●		20 mV/Pa ± 1 dB 2 mV/µbar ± 1 dB	ca. 8 Ω balanced ground free	400 Ω (200 Ω up to 20 Pa)	ca. 73 dB	30 Pa ≙ 124 dB	●			12 V ± 2 V	ca. 6 mA	●	
MKH 416 T-3				●				●							●					●	
MKH 416 TU				●				●												●	
MKH 416 TU-3				●				●							●					●	
MKH 416 P 48	40 . . . 20 000 Hz			●				●		25 mV/Pa ± 1 dB 2,5 mV/µbar ± 1 dB	ca. 10 Ω balanced	400 Ω (200 Ω up to 30 Pa)	ca. 72 dB	ca. 50 Pa ≙ 128 dB			●	48 V ± 12 V	ca. 2 mA	●	
MKH 416 P 48-3				●				●									●			●	
MKH 416 P 48 U				●				●									●			●	
MKH 416 P 48 U-3				●				●									●			●	
MKH 816 T	40 . . . 20 000 Hz			●					●	40 mV/Pa ± 1 dB 4 mV/µbar ± 1 dB	ca. 8 Ω balanced ground free	400 Ω (200 Ω up to 10 Pa)	73 dB	15 Pa ≙ 118 dB	●			12 V ± 2 V	ca. 6 mA	●	
MKH 816 T-3				●					●						●					●	
MKH 816 TU				●					●											●	
MKH 816 TU-3				●					●						●					●	
MKH 816 P 48	40 . . . 20 000 Hz			●					●	40 mV/Pa ± 1 dB 4 mV/µbar ± 1 dB	ca. 10 Ω balanced	600 Ω (200 Ω up to 15 Pa)	ca. 72 dB	ca. 30 Pa ≙ 124 dB			●	48 V ± 12 V	ca. 2 mA	●	
MKH 816 P 48-3				●					●								●			●	
MKH 816 P 48 U				●					●								●			●	
MKH 816 P 48 U-3				●					●								●			●	
MKH 106 T	20 . . . 20 000 Hz	●				●				20 mV/Pa ± 1 dB 2 mV/µbar ± 1 dB	ca. 8 Ω balanced ground free	600 Ω (200 Ω up to 20 Pa)	ca. 70 dB	ca. 30 Pa ≙ 124 dB	●			12 V ± 2 V	ca. 6 mA	●	
MKH 106 T-3		●				●									●					●	
MKH 106 TU		●				●									●					●	
MKH 106 TU-3		●				●									●					●	
MKH 106 P 48	20 . . . 20 000 Hz	●				●				20 mV/Pa ± 1 dB 2 mV/µbar ± 1 dB	ca. 10 Ω balanced	400 Ω (200 Ω up to 20 Pa)	70 dB	ca. 30 Pa ≙ 124 dB			●	48 V ± 12 V	ca. 2 mA	●	
MKH 106 P 48-3		●				●											●			●	
MKH 106 P 48 U		●				●											●			●	
MKH 106 P 48 U-3		●				●											●			●	
MKH 124 microphone module: / electronic module:	40 . . . 20 000 Hz	●				●				ca. 3,2 mV/Pa ca. 0.32 mV/µbar	ca. 150 Ω	2000 Ω	ca. 62 dB			●		8 V ± 2 V	ca. 5 mA	●	
MKH 125 T microphone module: / electronic module:	40 . . . 20 000 Hz	●				●				ca. 20 mV/Pa ca. 2 mV/µbar	ca. 20 Ω	ca. 200 Ω	ca. 62 dB	ca. 30 Pa ≙ 124 dB	●			12 V ± 2 V	ca. 6 mA	●	
MKH 125 T-3 microphone module: / electronic module:		●				●									●					●	
MKH 125 TU microphone module: / electronic module:		●				●									●					●	
MKH 125 TU-3 microphone module: / electronic module:		●				●									●					●	
MKH 126 P 48 microphone module: / electronic module:	40 . . . 20 000 Hz	●				●				ca. 20 mV/Pa ca. 2 mV/µbar	ca. 20 Ω	600 Ω (200 Ω up to 30 Pa)	62 dB	ca. 75 Pa ≙ 132 dB			●	48 V ± 12 V	ca. 2 mA	●	
MKH 126 P 48 U microphone module: / electronic module:		●				●											●			●	
MKH 110	1 . . . 20 000 Hz	●				●				20 mV/Pa ± 2 dB 2 mV/µbar ± 2 dB	ca. 90 Ω	2 kΩ	63 dB ± 3 dB	20 Pa		●		8 V ± 1 V	ca. 8 mA		●
MKH 110-1	$0_{\square}1$ . . . 20 000 Hz	●				●					ca. 90 Ω	2 kΩ	47 dB ± 3 dB	500 Pa		●		8 V ± 1 V	ca. 8 mA		●

RF CONDENSER MICROPHONES · TECHNICAL DATA

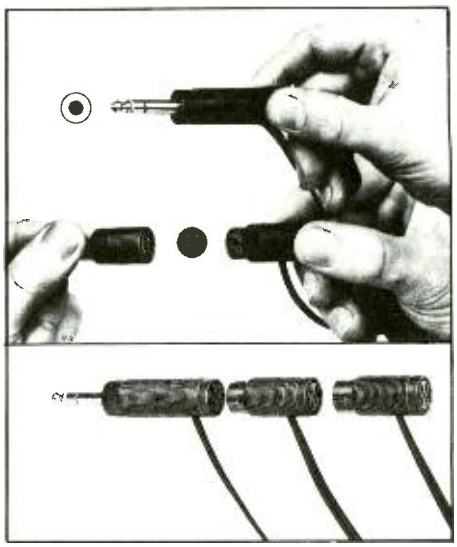
Model	Connector				Wiring				Cable plug					Dimensions in mm	Weight	Finish	Remarks
	threaded 3 pin plug, DIN 41 524	3 pin Cannon XLR	1 pole Lemo HF plug	threaded, 6 pin, T 3402 000	1 → audio (approx. + 5 V dc), 2 → 0, 3 → + 8 V	1 → audio, 2 → case, 3 → audio	1 → case, 2 → audio, 3 → audio	4 → audio, 1, 2, 5 → 0, 3 → 8 V	LEMO F 00250/AG/3 by LEMO RA 00250	threaded 3 pin cable plug DIN 41 524	3 pin Cannon female cable plug XLR-3-11 C	LEMO F 00250/AG/3 auf LEMO RC 00250/AG/3	threaded 6 pin cable plug T 3403 00				
MKH 406 T	●					●				●				⌀ 19 x 150	ca. 120 g	Satinnickel	
MKH 406 T-3	●					●				●						flat black	
MKH 406 TU		●					●				●			⌀ 19 x 165	ca. 135 g	satin nickel	
MKH 406 TU-3		●					●				●					flat black	
MKH 406 P 48	●					●				●				⌀ 19 x 150	ca. 120 g	satin nickel	
MKH 406 P 48-3	●					●				●						flat black	
MKH 406 P 48 U		●					●				●			⌀ 19 x 165	ca. 135 g	satin nickel	
MKH 406 P 48 U-3		●					●				●					flat black	
MKH 416 T	●					●				●				⌀ 19 x 235	160 g	satin nickel	
MKH 416 T-3	●					●				●						flat black	
MKH 416 TU		●					●				●			⌀ 19 x 250	175 g	satin nickel	
MKH 416 TU-3		●					●				●					flat black	
MKH 416 P 48	●					●				●				⌀ 19 x 235	ca. 160 g	satin nickel	
MKH 416 P 48-3	●					●				●						flat black	
MKH 416 P 48 U		●					●				●			⌀ 19 x 250	ca. 175 g	satin nickel	
MKH 416 P 48 U-3		●					●				●					flat black	
MKH 816 T	●					●				●				⌀ 19 x 540	ca. 360 g	satin nickel	
MKH 816 T-3	●					●				●						flat black	
MKH 816 TU		●					●				●			⌀ 19 x 555	ca. 375 g	satin nickel	
MKH 816 TU-3		●					●				●					flat black	
MKH 816 P 48	●					●				●				⌀ 19 x 540	ca. 360 g	satin nickel	
MKH 816 P 48-3	●					●				●						flat black	
MKH 816 P 48 U		●					●				●				ca. 375 g	satin nickel	
MKH 816 P 48 U-3		●					●				●					flat black	
MKH 106 T	●					●				●				⌀ 19 x 140	ca. 120 g	satin nickel	
MKH 106 T-3	●					●				●						flat black	
MKH 106 TU		●					●				●			⌀ 19 x 155	ca. 135 g	satin nickel	
MKH 106 TU-3		●					●				●					flat black	
MKH 106 P 48	●					●				●				⌀ 19 x 140	ca. 120 g	satin nickel	
MKH 106 P 48-3	●					●				●						flat black	
MKH 106 P 48 U		●					●				●			⌀ 19 x 155	ca. 135 g	satin nickel	
MKH 106 P 48 U-3		●					●				●					flat black	
MKH 124 Microphone:			●											MK 12: 11.5 x 36 x 12	ca. 91 g	flat black	For connection to Mikroport transmitter SK 1008-3
MKH 124 RF Module:				●				●						27 x 43		flat black	
MKH 125 T Microphone:			●						Microphone → RF Module	RF Module → Amplifier				MK 12: 11.5 x 36 x 12	ca. 37 g	flat black	
MKH 125 T RF Module:	●					●								⌀ 19 x 140	ca. 120 g	satin nickel	
MKH 125 T-3 Microphone:			●											MK 12: 11.5 x 36 x 12	ca. 37 g	flat black	
MKH 125 T-3 RF Module:	●					●								⌀ 19 x 140	ca. 120 g	flat black	
MKH 125 TU Microphone:			●						Microphone → RF Module		RF Module → Amplifier			MK 12: 11.5 x 36 x 12	ca. 37 g	flat black	
MKH 125 TU RF Module:		●					●							⌀ 19 x 155	ca. 135 g	satin nickel	
MKH 125 TU-3 Microphone:			●											MK 12: 11.5 x 36 x 12	ca. 37 g.	flat black	
MKH 125 TU-3 RF Module:		●					●							⌀ 19 x 155	ca. 135 g	flat black	
MKH 126 P 48 Microphone:			●						Microphone → RF Module	RF Module → Amplifier				MK 12: 11.5 x 36 x 12	ca. 37 g	flat black	
MKH 126 P 48 RF Module:	●					●								⌀ 19 x 140	ca. 120 g	Satinnickel	
MKH 126 P 48 U Microphone:			●								RF Module → Amplifier			MK 12: 11.5 x 36 x 12	ca. 37 g	flat black	
MKH 126 P 48 U RF Module:		●					●							⌀ 19 x 155	ca. 135 g	Satinnickel	
MKH 110	●				●					●				⌀ 20 x 126	ca. 90 g	Satinnickel	
MKH 110-1	●				●					●				⌀ 20 x 126	ca. 90 g	Satinnickel	

4 HEADPHONES AND HEADPHONE/MICROPHONE COMBINATIONS

Today Sennheiser is the leading manufacturer in the field of HiFi stereo headphones. Sennheiser patent 153 7700 was filed on the 4. 11. 1967 and granted on 4. 11. 1976. Based on this copyright alone, well in excess of two million HD 414 open stereo headphones were manufactured and marketed throughout the world. No other HiFi stereo headphone has as yet achieved anything like this figure. To secure and expand upon this success Sennheiser has in recent years created a wide range of stereo headphones from the budget priced version right through to the electrostatic top of the range models. Attention has been concentrated on the "open" headphones, which are particularly acoustically neutral and supremely suitable also for the reproduction of dummy head binaural recordings.

PX 1 Universal Jack Plug

Despite the variety of headphone connecting sockets on hi-fi equipment it is possible with the new PX 1 universal jack plug to connect up all dynamic Sennheiser headphones to both Cube 5 and 6.3 mm jack sockets. The PX 1 is a combination connector incorporating a Cube-5 plug when the jack is removed. With the aid of this connector you can use the most varied range of equipment with one single Sennheiser headphone. Additionally the mated interconnecting plug system permits two or more headphones to be connected up to one headphone socket.



unipolar 2000

Frequency range: 16 to 20,000 Hz.
Open electrostatic transducer principle.
Suitable for connection to all stereo sound sources with loudspeaker output.
Control box for two unipolar headphones with optical overmodulation indicator.

The reputation for superiority, for use by the professionals, is attached historically to both condenser microphones and to electrostatic headphones. Sennheiser endeavoured to ensure that its first electrostatic headphones operated the open transducer principle. In addition the high voltage powerpack required for previous electrostatic headphones was to be avoided. Sennheiser has resolved both of these problems with the unipolar 2000 hi-fi electret headphones, the first open electret headphone in the world. After thorough testing it was given the following assessment by the chief editor of the magazine "Hi-Fi Stereophonie", Karl Breh:
"As no other predecessor, this headphone generates a sound quality which can be described as ample, spacious, transparent and volatile while nevertheless remaining well-defined and completely natural. Naturally a decisive role in the overall quality of this headphone is played by the large-area diaphragms. The first-class workmanship is another noteworthy feature."

HER 2000 unipolar 2000

The two electrostatic transducer systems in the unipolar 2000, with their extremely small oscillating masses, convey undistorted reproduction of even the finest sound structures. It is worth mentioning that the highest frequency transmitted by the unipolar 2000 is already well outside the human listening range.

The HER 2000 control box required for the unipolar is supplied in the "set" version with standard loudspeaker jacks and in the "set X" version with spade connector lugs.

Two unipolar electret headphones can be connected to the HER 2000 control box, the facility for the volume of one headphone to be reduced by 6 or 12 dB is by pushbutton control. The maximum permissible level is indicated by one LED per channel. Additionally a switch is provided in the control box for optional headphone/loudspeaker operation. The maximum switching current is 5 Amps, i. e. 100 Watts to 4 Ohms.
Relevant technical data for unipolar 2000 and 2002 will be found in the Summary on pages 80 to 81.

unipolar 2002

Frequency range: 16 to 22,000 Hz.
Electrostatic two-way principle.
Suitable for connection to all stereo sound sources with loudspeaker output.
Control box for two unipolar headphones with visual overmodulation indicator.

By contrast with the unipolar 2000, the 2002 is an electrostatic headphone which is enclosed about the ear and open to the back. For the first time in a headphone, the construction is based on an electrostatic two-way system without switching network. The concentric layout of these two systems in one plane ensures avoidance of the otherwise unavoidable distortion attributable to propagation time and enhances the overall volume.
In this mode of construction the diaphragm surface consists of two parts, the inner surface radiating the medium and high frequencies through the rigidity of the air "padding" of 0.5 mm. The outer, annular diaphragm radiates the low frequencies. The smooth transition between these two systems sensure total avoidance of undesirable response irregularities.

HER 2000 unipolar 2002

Optimum-Open Hi-Fi Stereo Headphones

HD 430

HD 430

Frequency response: 16 to 20,000 Hz.
Optimum-open dynamic transducer system.
Extremely small cobalt-samarium magnetic system.
Whirl-shaped diaphragms.
Weight approx. 194 g.
Break-resitant steel connecting lead.

This is the best in the dynamic range of stereo headphones marketed by Sennheiser. Repeatedly the headphone has been compared by product reviewers and by other audio experts with the unipolar 2000. This is hardly a surprise, since the extremely small mass of its whirl-shaped diaphragms imparts a superlative transient response to the HD 430. To this is added the extremely small diameter of the powering system assembled from cobalt-samarium magnets and which measures only 16 mm. These minimal dimensions ensure that the ear inlet is not obstructed by acoustically disruptive surfaces which might impair the sensation of unobstructed hearing.

Sennheiser describes this innovatory system as "optimum-open". The circumaural ear custions in conjunction with the low overall weight and nominal sealing pressure impart unparalleled wearing comfort to the HD 430. In its simplest terms this headphone offers an ideal combination of all aspects, including tonal quality, wearing comfort and design. It has therefore been no surprise that it managed to achieve a leading position among audiophiles throughout the world within a few weeks of its introduction.
Relevant technical data will be found on pages 80 to 81.


Universal plug connector

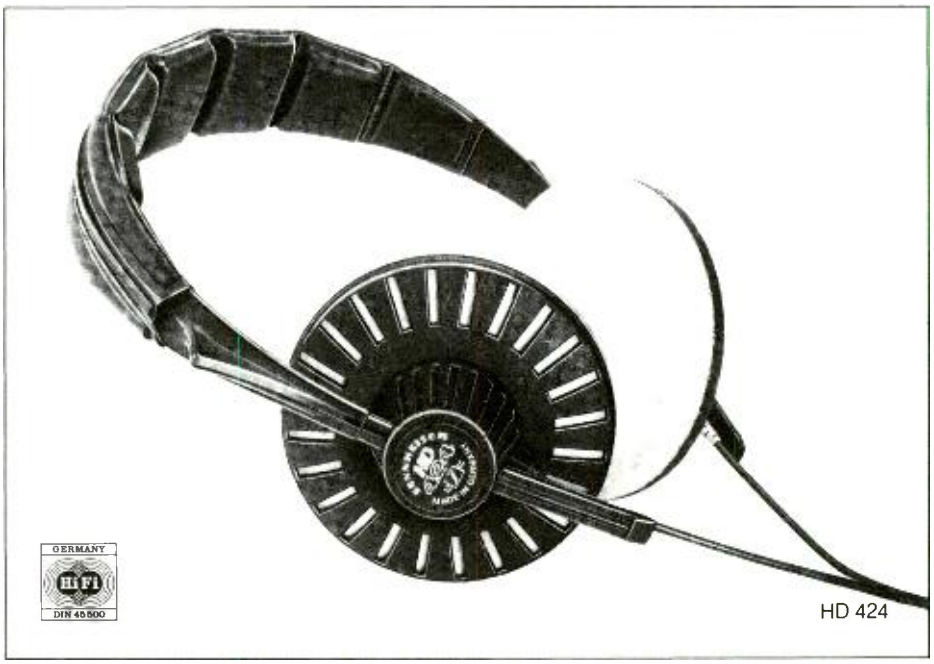
Recommended accessories

HD 430

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connection)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Open Hi-Fi Stereo Headphones

HD 424



HD 424

Frequency response: 16 to 20,000 Hz.
Open dynamic transducers.
New, lightweight magnetic system.
Whirl-shaped diaphragms.
Large-area soft expanded foam ear cushions.
Weight: approx. 115 g.
Break-resistant stainless steel lead.

The HD 424 is the headphone which has, in terms of quantity, achieved second place in the range of headphones manufactured by Sennheiser. It is a further development of our internationally successful HD 414. With the HD 424, which in addition to the well-proven whirl-shaped diaphragms, incorporates a new miniaturised magnet system, it has been possible to achieve a further improvement in the frequency response as well as more favourable performance in respect of intermodulation distortion.
The impedance of the new HD 424 is 600 Ohms, which is optimised for the headphone outputs in conventional use today.

Its weight of 120 g ensures that the headphone remains comfortable even after it has been worn for hours. The headphone capsules can be moved up and down the headband to lock into the ideal position for the wearer, ensuring correct positioning directly inline with the ears, irrespecitive of the shape of the wearer's head. The velvet-soft expanded foam earpads with a diameter of 90 mm distribute the very low contact pressure uniformly over the entire ear surface.
Relevant technical data will be found on pages 80 to 81.


Universal plug connector

Recommended accessories HD 424

Connecting lead	Connecting chains	Headphone Connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connecting)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Optimum-Open Hi-Fi Stereo Headphones

HD 420

HD 420

Frequency response: 18 to 20,000 Hz.
Optimum-open dynamic transducer system.
Extremely small cobalt-samarium magnet systems.
Whirl-shaped diaphragms.
Weight approx.: 129 g.
Break-resistant stainless steel connecting lead.

Here no wishes have been left unfulfilled. In its major test report, the magazine "HiFi Stereophonie" writes, among other things: "Comfort extremely good, no distortion, excellent sound definition. This is the dynamic headphone in the upper middle class offering an extremely good price to quality ratio."

The extremely small mass of the whirl-shaped diaphragms imparts a superlative transient response to the HD 420. To this feature is added the extremely small diameter of only 16 mm of the powering system manufactured with cobalt-samarium magnets. This ensures that the ear inlet is not obstructed by acoustically discruptive surfaces which might impede the sensation of open listening.

Sennheiser describes this innovation as "optimum-open". The HD 420 offers an extremely high standard of wearing comfort. It is the headphone for the discriminating buyer who knows how to value modern design, wearing comfort and perfection of sound reproduction in equal measure.
Relevant technical data will be found on pages 80 to 81.


Universal plug connector

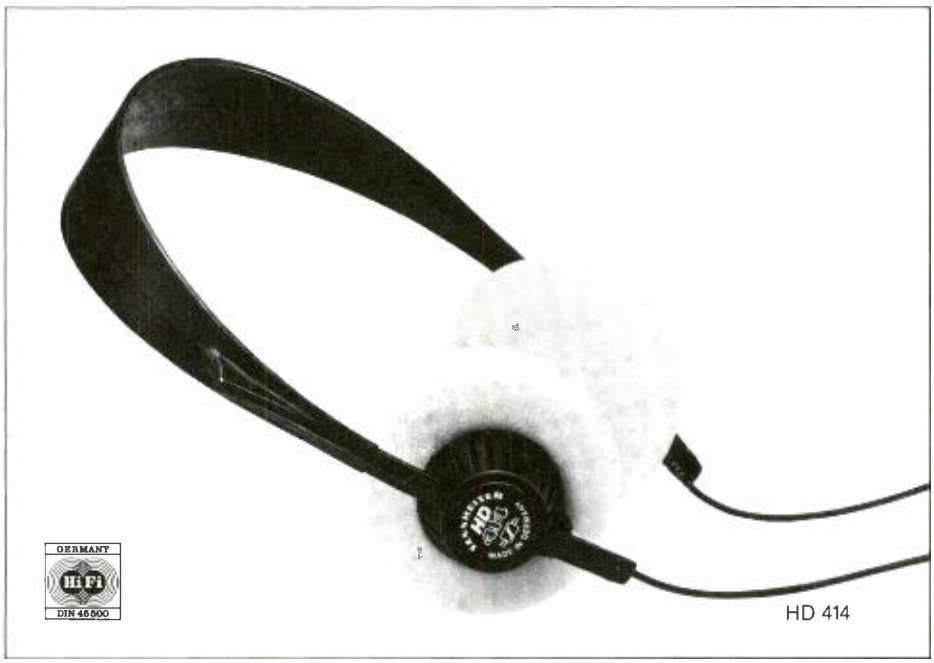
Recommended accessories

HD 420

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connection)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

Open Hi-Fi Stereo Headphones

HD 414



HD 414

Frequency response: 20 to 20,000 Hz.
Open dynamic transducers.
New, lightweight magnet system.
Whirl-shaped diapragms.
Large-area soft expanded foam ear cushions.
Weight: approx. 73 g.
Break-resistant stainless steel connecting lead.

The HD 414 has become an international success as the first "open" stereo headphone. The principle is being exploited by Sennheiser licencees throughout the world.
The well-proven whirl-shaped diaphragms are now also fitted in the HD 414. In conjunction with a new miniaturised magnet system this optimises the acoustic conditions, i. e. a more balanced frequency response and further reduction in intermodulation distortions. The impedance of the new HD 414 is 600 Ohms which is thus adapted to conventional headphone outputs in modern equipment. Additionally it has been possible to reduce the weight of the HD 414 significantly to a mere 73 g, a clearly discernible positive feature particularly when the headphone is worn for long periods.
The soft, air-permeable expanded foam ear cushions and very low contact pressure of the headband ensure that the headphone lies gently against the ears. The headphone capsules slide along the headband and can be locked in an ideal position to adapt to any shape of head.
Relevant technical data will be found on pages 80 to 81.

Universal plug connector

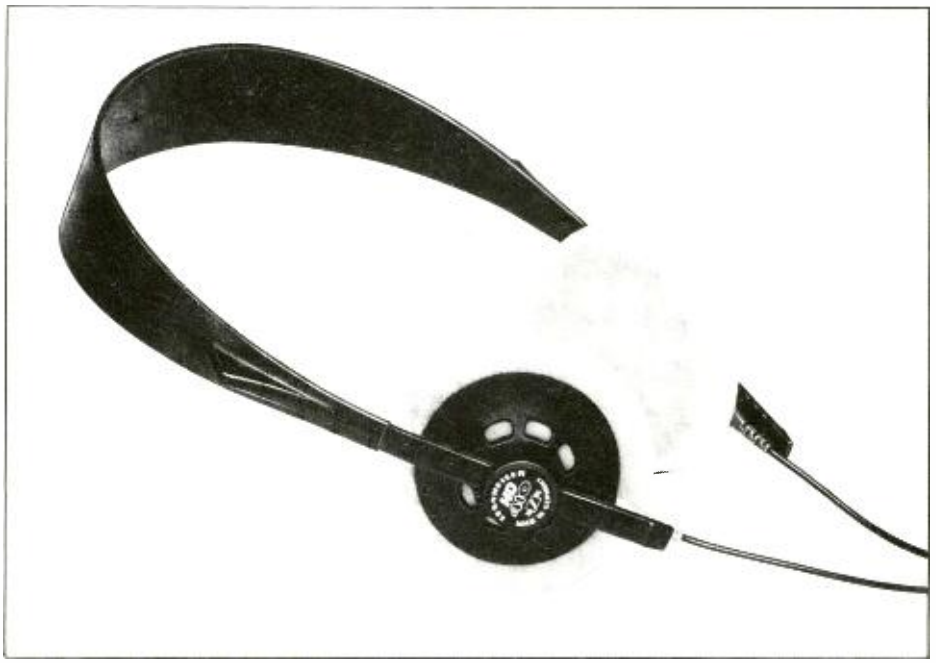
Recommended accessories

HD 414

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connection)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Stereo Headphones

HD 410 · HD 410-6

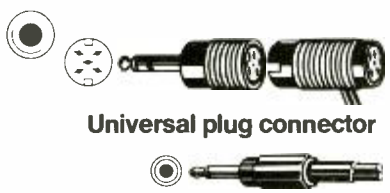


Frequency response: 20 to 18,000 Hz.
Dynamic transducer principle.
600 ohm systems.
Superlight, only 80 g.
Plug-in lead connectors.

This is particularly popular with younger people, with a limited budget. Nevertheless they still want to have the benefits of the traditional workmanship and sound quality for which Sennheiser headphones are distinguished. Moreover the HD 410 is also suitable for universal use, as the connecting leads are interchangeable. This means that this headphone can also be modified at any time for use as a TV stereo or TV mono headphone; all that is needed is to replace the lead, which in the TV stereo version HZR 26-37 has a length of 7 m and also incorporates a control unit. This permits independent volume adjustment for the left and/or right earphone.

Owing to its low weight and comfortable expanded foam ear cushions, as with any other Sennheiser headphone, the wearing comfort is optimised. Even those music enthusiasts who prefer to withdraw from the rest of the world for hours on end to listen to their beloved music through the HD 410 are hardly aware of the fact that they are wearing a headphone. The HD 410 conveys the total audible range with all nuances in bass and treble that the music enthusiast may desire.

The HD 410 is suitable for connecting to any stereo unit. It has a matt-black housing and chrome yellow expanded foam ear cushions which can be easily washed whenever necessary. The additional embossed pattern on the earphone cases improve the overall attractiveness of this headphone, which is also an ideal gift.
The HD 410 is also available as a monitor headphone (mono) under the designation HD 410-6. It is fitted with a 3.5 mm jack connector and the connecting lead is 0.9 m in length. Parallel coupling of the two capsules gives a rated impedance of 300 ohms.
For relevant technical data see pages 80 to 81.



Universal plug connector

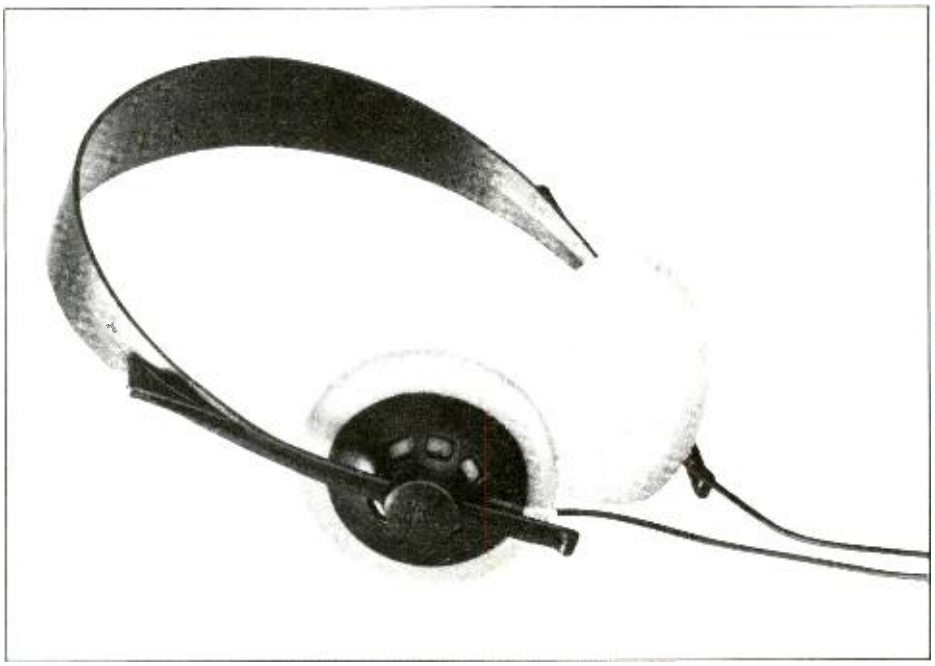
Recommended accessories

HD 410

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain	**HZA 414** (3-fold headphone connection)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Stereo Headphones

HD 400



Frequency response: 20 to 18,000 Hz.
Dynamic transducer principle.
600 Ohm systems.
Weight: approx. 80 g.
Break-resistant stainless steel connecting lead.

The HD 400 is an ideal complement in the internationally renowned Sennheiser range of stereo headphones. It has been designed especially for the younger generation who want to own a headphone of this quality at a reasonable price. The wearing comfort is exemplary, owing to the extremely low weight of only 80 g. The velvet-soft expanded foam ear chushions are extremely comfortable to wear and the audible impression is fully equivalent to natural free hearing. The HD 400 does not exert any contact pressure even after it has been worn for hours on end.

The entire audible range is conveyed with natural bass and transparent treble. The headphone capsule elements can be adjusted and lock into any desired position on the headband. The stainless steel connecting lead is extremely rugged and well able to withstand large stresses. The impedance of 600 Ohms allows the HD 400 to be connected without difficulty to any stereo unit with the aid of the PX 1 unversal jack connector or with the standard loudspeaker connector plug.

The housing of the HD 400 has a matt-black finish, contrasting attractively with the chrome yellow expanded foam ear cushions which are easily washed with ordinary domestic detergents.
See relevant technical data on pages 80 to 81.

Universal plug connector

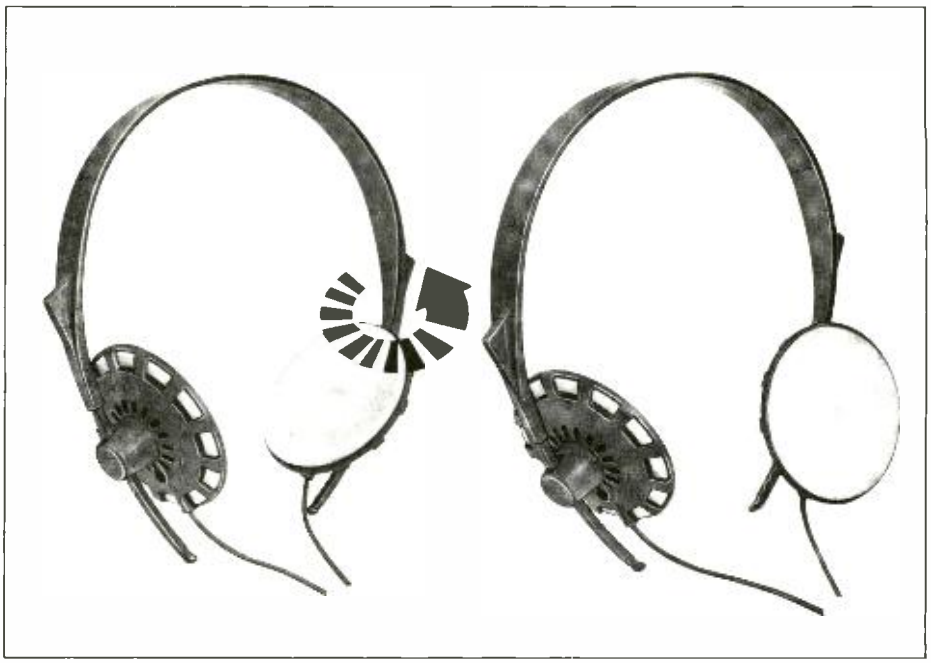
Recommended accessories

HD 400

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
	HZK 414-17 (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)				

4 Stereo Headphones

HD 40



Frequency response: 22 to 18,000 Hz.
Open dynamic transducers.
Ideals price/performance ratio.
Extremely lightweight, only 60 g.
Excellent reproduction characteristics.
Pivoted earphone capsules.

With the HD 40 stereo headphone Sennheiser has expanded the range of open headphones for those customers wishing to obtain excellent tonal quality and perfect wearing comfort at a budget price. The headphone is extremely lightweight and virtually unnoticeable when worn. The relatively large headphone capsules sit comfortably in position and adapt readily to the ear. In addition the larger headphone elements give a quality of sound which is fully in line with customary Sennheiser standards. The headphone capsules can be pivoted by 90° about the headband axis to permit safe storage in even the shallowest drawer, also when travelling. The HD 40 is fitted with the PX 1 universal jack connector. This universal plug is suitable for connecting to Cube-5 sockets or 6.3 mm jack sockets. In addition the multi-purpose connector permits two or more headphones to be connected to one headphone jack socket. The leads are fixed permanently and, as with all Sennheiser headphones, are of stainless steel, ensuring that even the most economically priced stereo headphone from Sennheiser is just as reliable and efficient in operation as its most expensive counterpart.

Relevant technical data on pages 80 to 81.

Universal plug connector

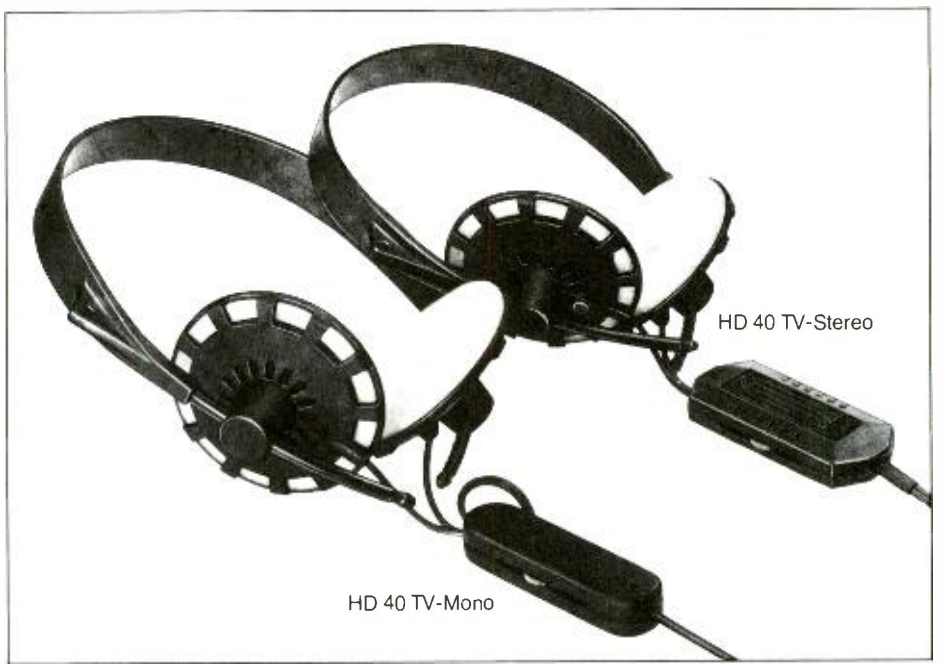
Recommended accessories

HD 40

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
	HZK 414-17 (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)				

4 TV Headphones

HD 40 TV-Stereo · HD 40 TV-Mono · HD 40 TV-6



Frequency response: 22 to 18,000 Hz.
Open dynamic transducers.
Ideal price/performance ratio.
Extremely lightweight, only 60 g.
Excellent quality of reproduction.
Long connecting lead.
Pivoted headphone capsules.

There has been a dramatic and continuing increase in the number of Sennheiser enthusiasts choosing to use their headphones in conjunction with TV viewing. The reasons are obvious, as frequently one may wish to concentrate or does not wish to disturb others. With the new stereo TV audio systems the quality of sound can be heard with the same brilliance as on has become accustomed to from headphones used in conjunction with stereo hi-fi equipment. The HD 40 TV headphones are extremely lightweight and remain virtually unnoticeable when being worn, even for many hours.

At the same time the relatively large headphone capsules sit comfortably on the ear and at the same time guarantee perfect sound quality, owing to the balanced capsule diameter which is essential for good quality audio reproduction. The headphone capsule also pivot by 90° on the headband so that the headphone can, for example, easily be slipped away safely under the TV set. Each of the stereo TV headphones is fitted with volume controls. The HD 40 TV Stereo is fitted with a 7 m long connecting lead and a dual potentiometer to allow independent volume control on both channels. The PX 1 universal connector jack is fitted to the connecting lead, suitable for Cube-5 socket and 6.3 mm connecting jack socket.
By contrast with the HD 40 TV Stereo, the HD 40 TV and the HD 40 TV-6 are fitted with only a single potentiometer for volume control in mono reproduction. The PX 1 universal connector is on the 7 m connecting lead for the HD 40 TV and a 3.5 mm jack connector on the HD 40 TV-6.
Technical data will be found on pages 80 to 81.

Universal plug connector

HD 40 TV-6
3.5 mm mono jack connector

Recommended accessories

HD 40 TV Stereo Mono

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
	 **HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)				

4 Enclosed Stereo Headphone with "Open Qualities"

HD 230

Frequency response: 10 to 30,000 Hz.
Widespread sound impression.
Two-way headphones without frequency dividing network.
Dynamic treble system for conveying the highest frequencies.
Lightweight wearing comfort.
Ideal screening of ambient noises.

This is the top-of-the-range headphone among the Sennheiser range of enclosed headphones. Here a skilful balance has been achieved in producing optimum sound quality – with a headphone which is apparently enclosed. Using these headphones it is possible to extract the full sound quality available even from digital sound carriers. For this purpose the HD 230 offers a range covering almost 12 octaves. This achievement has been rendered possible by two technological refinements:
In the headphone themselves use is made of two dynamic systems. The wideband system has been boosted by a tweeter system which, owing to its small dimensions, is particularly suitable for transmitting the high frequencies of 10,000 to 30,000 Hz. The transmission quality which this produces fulfils all requirements imposed on an enclosed headphone in the top quality bracket.

In addition the acoustic link between the front and rear of the wideband transducer in the enclosed housing produces the same audio-impression as the open headphone, while at the same time the headphones do not radiate any sound externally.
The low weight, relatively small contact pressure force and the soft, annular ear cushions impart the high wearing comfort for which the HD 230 is noted. Anyone accustomed to wearing headphones over a lengthy period of time will know how to value this feature. The impedance of 600 Ohms permits trouble-free connection to any stereo unit.
As with all Sennheiser headphones, the HD 230 is fitted with the interchangeable, rugged stainless steel connecting lead and PX 1 universal connecting jack.
The technical data will be found in the Summary on pages 80 to 81.

Universal plug connector

Recommended accessories

HD 230

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connector)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Enclosed Dynamic Hi-Fi Stereo Headphones

HD 224 X

HD 224 X

Frequency response: 16 to 20,000 Hz.
Enclosed dynamic transducers.
Thoroughly proven magnet system.
Weight: approx. 250 g.
Break-resistant stainless steel connecting lead.

This enclosed hi-fi stereo headphone guarantees excellent screening of ambient noise. Emphasis can be laid on the extreme wearing comfort, excellent transmission range and brilliant treble reproduction together with superb dynamic range. The lightweight, soft ear cushions enclose the ears comfortably to eliminate external noises without any trace of discomfort, even after hours of wearing.

Even at low volume levels virtually no ambient noises can be heard which might impair listening pleasure. The superlative acoustic qualities of this headphone render it particularly suitable for binaural stereo listening.
Technical data on pages 80 to 81.

Universal plug connector

Recommended accessories

HD 224 X

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
					
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connector)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Enclosed Dynamic Hi-Fi Stereo Headphones

HD 222

HD 222

Frequency response: 16 to 20,000 Hz.
Enclosed dynamic transducers.
Extremely small cobalt-samarium magnet system.
Whirl-shaped diaphragms.
Weight only 250 g.
Excellent sound sealing.
Break-resistant stainless steel connecting lead.

With this enclosed hi-fi stereo headphone Sennheiser offers a classic alternative for the enthusiasts for enclosed headphones. Here no compromise has been shown in applying the very latest headphone technology: the small powerful cobalt-samarium magnet system has been incorporated, together with the well-proven whirl-shaped diaphragms. The result is a headphone with an extremely wide frequency range which produces an unusually high dynamic performance without distortion.
This headphone is extremely lightweight by comparison with all other enclosed models. Nevertheless its soft ear cushions guarantee excellent sealing against ambient noises. The colour scheme of black and gold with matt-black ear cushions gives the headphone an appropriately professional appearance. As with all Sennheiser headphones this new model is also fitted with a break resistant, plug-in stainless steel connecting lead.
Relevant technical data will be found on pages 80 to 81.

Universal plug connector

Recommended accessories

HD 222

Connecting lead	Connecting chains	Headphone connection	Stereo control	Infrared transmitter	Control units
HZL 26-4 **HZL 26-7** **HZL 26-3** **HZL 26-17**	**HZK 414-17** (30-fold headphone connecting chain) **HZK 414-17-1** (10-fold headphone connecting chain)	**HZA 414** (3-fold headphone connection)	**HZR 26-4** **HZR 26-13** **HZR 26-17** **HZR 26-33** **HZR 26 PX**		

4 Wireless Infrared Stereo Headphones

HDI 234 "HiDyn" with Stereo Transmitter SI 234 "HiDyn"

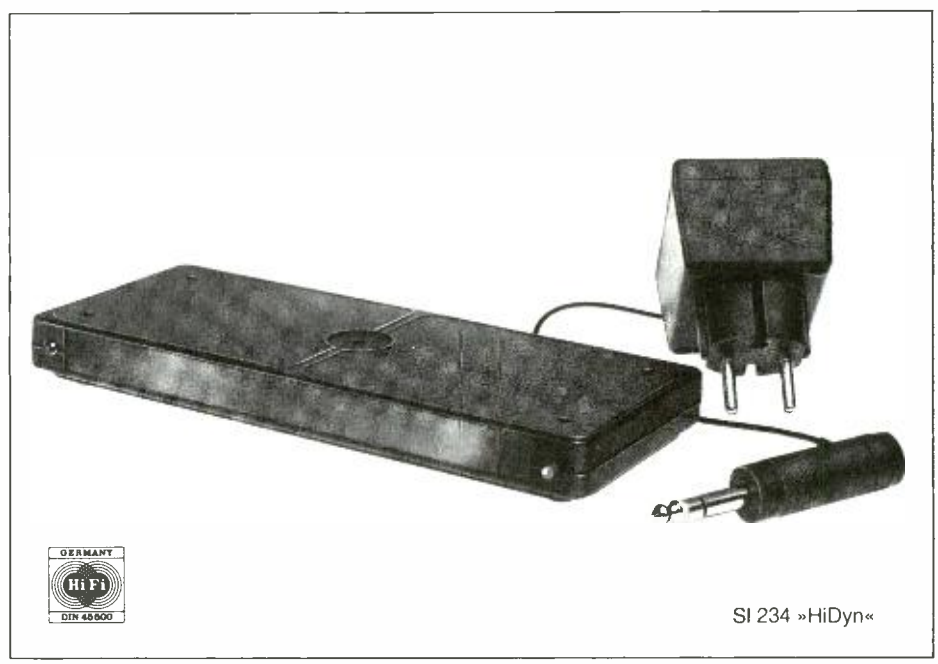
Infraport

HDI 234 »HiDyn«

Wireless infrared stereo transmission.
With "HiDyn" compander system.
Frequency response: 20 to 20,000 Hz.
Enclosed dynamic transducer principle.
Wide dynamic range.
Separate volume control for each ear.
Three operating modes: mono left, stereo, mono right.

This Infraport stereo system from Sennheiser fulfils the wish of many years standing for wireless stereo listening in true hi-fi quality without troublesome leads. You simply put on the HDI 234 "HiDyn" infrared stereo headphone and switch it on. The invisible and guaranteed harmless infrared beam transmits the sound of your hi-fi stereo system with optimum quality. You can adjust the volume for each ear independently by means of the easily accessible slide controls, which also allow you to achieve a perfect balance. The compander system used with the HDI/SI 234 "HiDyn" enhances the transmission quality and widens the dynamic range: the "HiDyn" noise suppression process compresses the sound signal to be transmitted at the transmitter end initially to the point where the effect of any interference arising along the transmission path are virtually eliminated. At the receiver end the audio signal is then expanded in mirror image to the point where it fully reflects the original audio signal at the transmitter end but without being impaired by any interference en route. It incorporates a 3-position switch which, in addition to the stereo transmission, provides two further switch settings for "mono left" and "mono right". This provides you with a switch adjustment for selecting either the local dubbed language or the original foreign text when watching foreign films. Despite the receiver circuit including the battery necessary for this wireless transmission system, the HD 234 "HiDyn", at 260 g, is no heavier than many conventional enclosed headphones. The receiver is powered from a 9 Volt battery. The maximum adjustable volume of the SI 234 "HiDyn" has been adapted to a requirement for sound recording studios. The ear-enclosing annular cushion gives this Sennheiser headphone a secure seating and optimum wearing comfort.

The flat Infraport stereo transmitter SI 234 "HiDyn" is only 23 mm in height, so that it can be pushed unobtrusively under the control unit. One lead is connected to the mains supply and the other to the headphone socket on your amplifier. The SI 234 is switched on by a small pushbutton switch. An LED display indicates correct modulation level. If the infrared light emission of the SI 234 "HiDyn" stereo transmitter is inadequate in larger rooms it can be boosted with an SZI 434 infrared stereo booster unit. For this purpose a jack socket is provided on the back of the SI 234 "HiDyn" for connecting up the 7.5 m lead which is included as standard with the SZI 434. The SI 234 infrared transmitter is mains powered and fitted with an On/Off switch and a modulation display. Using a suitable adapter additional SZI 434 Infraport stereo booster can be connected to the SI 234 "HiDyn" transmitter.
Relevant technical data will be found on pages 85 and 93.



SI 234 »HiDyn«

4 Wireless Infrared Monaural Stethoscope Receiver HDI 406
Infrared Monaural Transmitter SI 406

Infraport

SI 406

HDI 406

Frequency response: 100 to 10,000 Hz.
Wireless mono sound to both ears.
Stepless volume control.
On/Off switch.
Powered by rechargeable power plug.
Weight: only 65 g.

The wish frequently expressed particularly by older TV watchers to be able to hear TV sound more intelligibly without being tied to connecting wires has now been fulfilled by the Sennheiser infrared monaural sound transmission system.
All that is needed is to slip on the Infraport mono stethoscope HDI 406 and switch it on. The invisible and harmless infrared light beam transmits the TV sound with a better quality of intelligibility than is normally delivered by the ordinary TV loudspeaker. You can adjust the volume to exactly your own requirements without inconveniencing other members of the household or neighbours.
The power supply is obtained from a power plug which is simply plugged into any mains socket overnight for recharge. After being plugged in for up to five hours the power plug is fully charged and ready to run for the remaining 19 viewing hours next day. If more frequent use is required it is advisable to purchase a second power plug to allow alternate use as needed.
The infrared transmitter unit for the HDI 406 is of particularly flat and unobtrusive design to avoid impairing the overall visual impression of your TV set. The Infraport SI 406 mono transmitter is only 17 mm in height so that it can be pushed away under the TV set where it is completely out of sight. One connecting lead plugs into the mains socket and the other into the headphone connection socket on your TV set. As your TV set is switched on the SI 406 is automatically switched on simultaneously and is switched off again automatically when the TV set is switched off.
Technical data will be found on pages 84 and 93.

For the hard of hearing the transmitter and receiver unit are available in a special version designated HDI 406 S/SI 406 S. This version maintains a suitable transmission performance. The description of this equipment will be found on pages 112 to 117.

HDI 406 GZS 406

4 Dynamic Mono Headphones

HD 4004 · HD 4004 PX · HD 4004-6

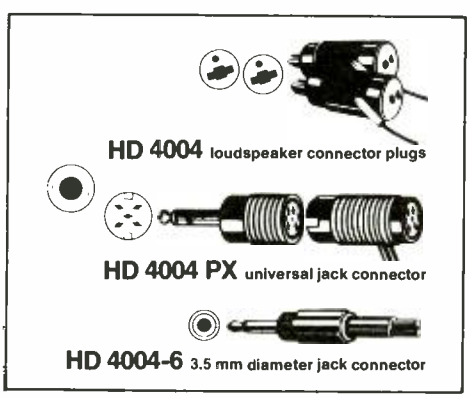
Frequency response: 100 to 6,000 Hz.
Dynamic 17 Ohm transducer.
Bass and treble adjustment.
7.5 m connecting lead.
Weight: only 16 g.

This small HD 4004 dynamic stethoscope headphone is ideal for all types of monaural sound transmission. It is particularly popular with TV enthusiasts wishing to hear late night programmes without disturbing neighbours or sleeping children. However, the HD 4004 is equally popular with the younger generation for plugging into their portable transistor radios, tape and cassette recorders, record players and radio recorder units.

The HD 4004 transmits the sound from all of these units fully and distinctly and adds an acceptable volume. It can be adjusted from the volume control on the unit and then from the built-in volume control on the headphone itself as required. Independently of the tone control on the unit, the bass level can also be adjusted on the headphone. The headphone is fitted with a universal jack connector on the HD 4004 PX version and with a 3.5 mm diameter jack plug on the HD 4004-6 version.

The connecting lead is 7.5 m in length to allow adequate freedom of movement. To ensure that the HD 4004 and its connecting lead can be stored away neatly after use, each HD 4004 is supplied complete with a plexiglass frame into which the headphone is simply clipped and the lead can also be wound away neatly. This frame can be fastened on any smooth surface, for example on the side of the TV set.

See technical data on pages 80 to 81.



4 Hi-Fi Stereo Headphones with Coiled Flexible Suspension Leads

HD 400-9 · HD 414-9 · HD 420-9 · HD 424-9 · HD 430-9 · HD 222-9

The Sennheiser hi-fi stereo headphone on a coiled flexible suspension lead is an invaluable feature which will be seen frequenctly at exhibitions and trade fairs, in record shops, information booths and wherever audio material is being generated. The coiled suspension lead, which can be hung from the ceiling, gives protection against tangling even in circumstances of the most active use. Adaptation to different heights of listeners is automatic and it has been found time and again that headphones suspended in this manner attract an extraordinary number of passers-by, encouraging them to put on the earphones and listen to whatever information is beeing disseminated. It is for this reason that Sennheiser markets its entire range of open dynamic hi-fi stereo headphones in this special version.
Technical data will be found on pages 80 to 81.

Dynamic Stick Phone

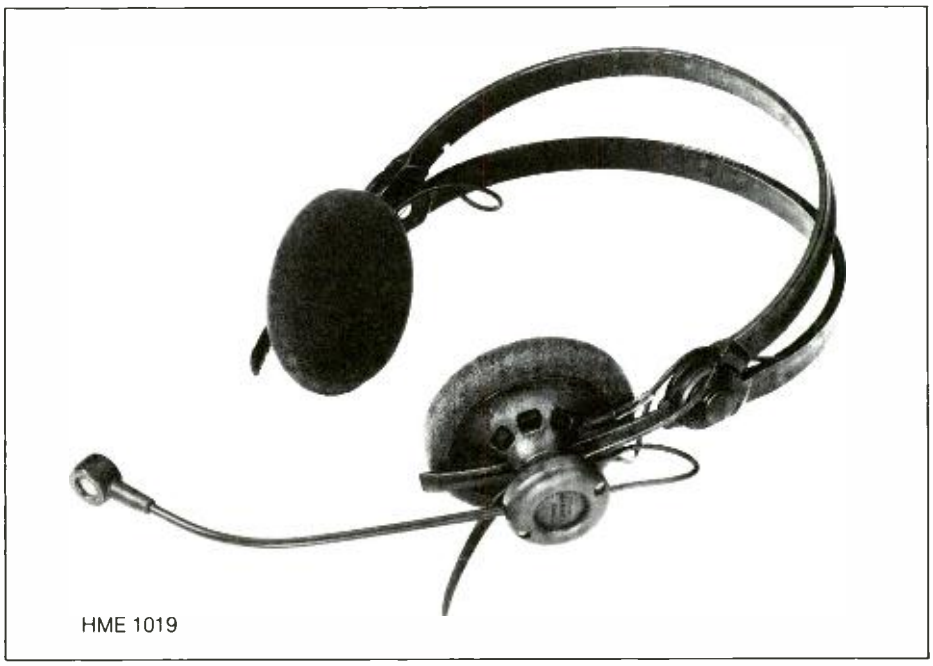
HD 412

Frequency response: 20 to 20,000 Hz.
Open dynamic transducers.
Thoroughly proven magnet system.
Weight: 105 g.
Rugged, heavy duty helically coiled lead.
Replaceable expanded foam ear cushions with plastic cover.
Supplied including installation kit for setting up counter service facilities.

The HD 412 dynamic stick phone from Sennheiser is another interesting alternative for use as a sales aid in record shops, general dissemination of information and for trade fairs and exhibitions. If suspension from the ceiling poses difficulties the accommodation in some type of bar or counter offers the only alternative. The stick phone is accompaned by a suitable assembly kit for fitting the phone into bar or counter tops. For stereo transmission the phone should ideally be mounted at a slight distance apart in pairs. The transmission quality of the HD 412 is exactly the same as the HD 414, as the identical systems have been employed.
Technical data will be found on pages 80 to 81.

4 Open Headphone/Microphone Combination

HME 1019



HME 1019

Frequency response of headphone: 20 to 18,000 Hz.
Frequency response of microphone: 20 to 18,000 Hz.
Impedance of headphone: 300 Ohms (2 systems with 600 Ohms parallel).
Impedance of microphone: 1000 Ohms.
Extremely high standard of speech reproduction to noise-compensated electret condenser microphone.

The HME 1019 headphone/microphone combination can be connected directly to the 1019 simultaneous interpreter system (see page 81). The headphone/microphone combination has been designed and developed for continuous use and is therefore fitted with an extremely lightweight HD 400 headphone which can be worn comfortably for long periods of time. To keep the combination down to a lowest possible total weight of 130 g an electret microphone has been used, in this case a noise cancelling electret condenser microphone. The HME 1019 headphone/microphone combination provides the ideal solution for working in noisy surroundings, e. g. in news reporting or wherever loud noise can prove disruptive, as for example in a simultaneous interpreting system. This is where the noise cancelling electret microphone comes into its own. It is designed for close-talking and positioned at mouth level. Exact positioning can be adjusted through a 360° arc and which can also be mounted either left or right and bent easily toward or away from the mouth. The ideal distance from microphone to mouth should be about 2 cm or 1 inch.
Another advantage is achieved by use of the extremely lightweight HD 400 headphone capsules in conjunction with a specially developed headband. With a total weight of 130 g (including microphone this combinaton is ideal for comfortable wearing for a period of hours on end.

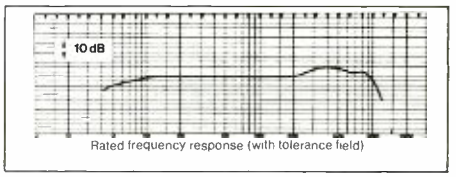
Open Headphone/Microphone Combination

HMD 414-6

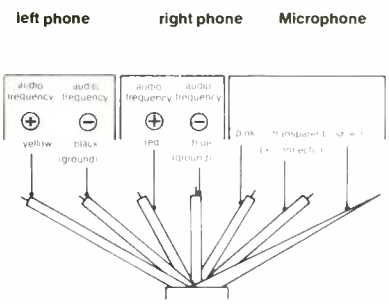
Windkap HMD 414-6

Frequency response of headphone: 20 to 20,000 Hz.
Frequency response of microphone: 50 to 12,000 Hz.
Dynamic transducer principle:
Headphone systems 600 Ohms.
Microphone system 200 Ohms.
Simple microphone adjustment.
Flexible microphone mounting.
Maximum microphone sensitivity in mouth direction by pronounced patented "displaced" directional characteristic.

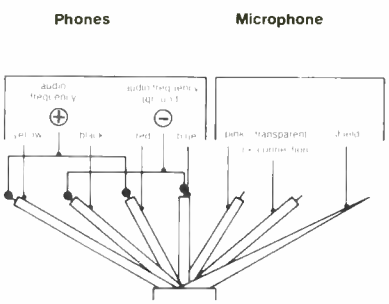
At the time of the World Cup football competition in Mexico in 1970 the German broadcasting organisation foresaw a special problem confronting them: they were aware that the enthusiasm of football audiences in Central and South America was said to be distincly greater than in Europe. For the reporters working there in the football stadium this meant that a considerable amount of crowd noise was to be anticipated, on the order of 10 to 15 dB above the levels to which they had been accustomed in Europe.
Conventional headphone/microphone combinations were totally unable to cope with these conditions. Consequently Sennheiser launched development work on a totally new headphone/microphone combination based on the world-proven HD 414 model. A microphone which could be positioned at varying angles to the mouth and with a directional characteristic which could be described as "displaced" in relation to the mouth was developed and patented. As a result of this unusual solution all transmissions on West German radio and TV from the World cup championships in Mexico – and naturally also from numerous other similar events since that time – have been reproduced in perfect quality despite any amount of background crowd noise.



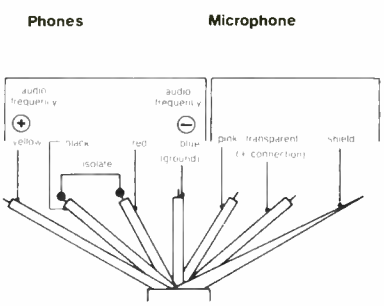
Microphone in close-talking 1 cm to the side of the mouth angle.



Stereo Connection impedance 600 Ω per driver



Monaural Connection, both 600 Ω drivers in parallel, resulting in 300 Ω impedance.



Monaural Connection, both 600 Ω drivers in series, resulting in 1200 Ω impedance.

Microphone

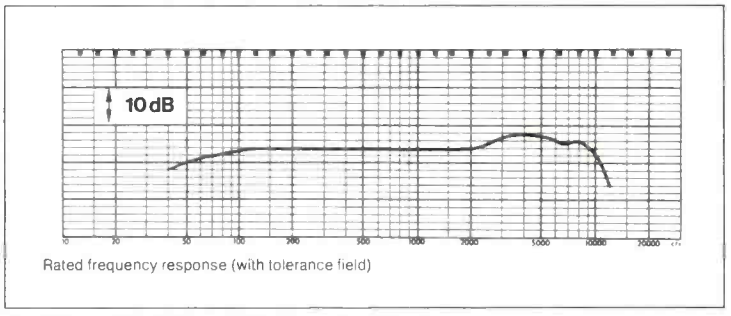
Technical data	Response	Acoustical Mode of Operation	Directional Characteristic	Rejection at 100 Hz	Open Terminal Output Voltage at 1000 Hz	Electrical Impedance at 1000 Hz	Magnetic Interference at 50 Hz	Lead
HMD 416-6 HMD 224	50 . . . 12 000 Hz	Pressure Gradient	Super Cardioid	120 °/20 dB – 2 dB	1 mV/Pa ± 3 dB	200 Ω	1 µV/5 µT	Termination pigtails

4 Enclosed Headphone/Microphone Combination

HMD 224

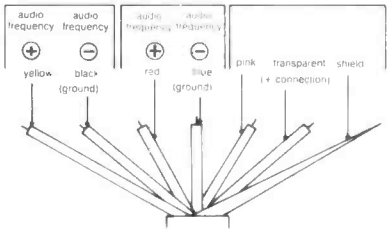
Frequency response of headphone:
16 to 20,000 Hz.
Frequency response of microphone:
50 to 12,000 Hz.
Dynamic transducer principle:
Headphone drivers 200 Ohms.
Microphone system 200 Ohms.
Microphone easily adjustable.
Maximum sensitivity of microphone in direction of mouth owing to distinctive "displaced" directional characteristic.

The high electro-acoustical quality and rugged mechanical design of the enclosed Sennheiser HD 224 headphone with circumaural air-filled double-layer plastic air cushions forms the basis of the HMD 224 headphone/microphone combination. The directional microphone used for this purpose is identical to that used in the HMD 414-6 described previously and naturally displays the same advantages. The combination of headphone and microphone weighs a total of only 360 g. It is therefore lightweight and comfortable to wear and is absolutely ideal for studio use and a wide range of commercial application.

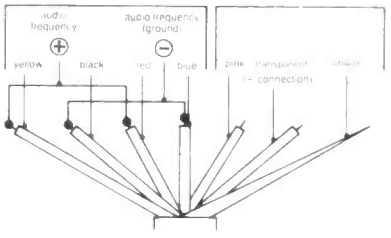


Rated frequency response (with tolerance field)

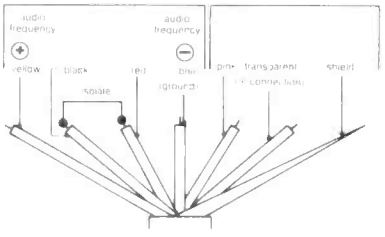
Microphone in close-talking 1 cm to the side of the mouth angle



Stereo connection HMD 224 X impedance 200 Ω per driver.



Monaural Connection HMD 224 C, both 200 Ω drivers in parallel, resulting in 100 Ω impedance.



Mono Connection HMD 224 X, both 200 Ω drivers in series, resulting in 400 Ω impedance.

Headphones

Technical Data	Transducer Principle	Frequency Response	Impedance (DIN 45 500)	Sensitivity at 1000 Hz	Max. Continuous Power	Distortion (DIN 45 500)	Coupling to the Ears	Contact Pressure	Weight	Connecting lead	Comments
HMD 416-6	dynam.	20 to 20 000 Hz	2000 Ω	per driver: 94 dB (≙ 1 Pa) at 1 mW corresponding 1.41 mV on 2000 Ω	0,1 W	< 1 %	supraaural	ca. 4.3 N	ca. 230 g	1.5 m long pigtailed steel cable	shockmounted microphone
HMD 224		16 to 20 000 Hz at the ear, flat	200 Ω	per driver: 94 dB (≙ 1 Pa) at 1 mW corresponding 450 mV on 200 Ω	0,5 W		circumaural	ca. 5 N	ca. 360 g		

4 Technical Data – Headphones

Model	Transducer principle: electrostatic	Transducer principle: dynamic	Frequency response	Impedance (of loudspeaker output)	Nominal impedance DIN 45500	Sensitivity at 1000 Hz	Sound pressure level for 5 V (= 6 W on 4 Ω)	Maximum sound pressure level	Power handling capability (DIN 45580) testing rules (DIN 45582)	Maximum voltage	Distortion: Full modulation at 110 dB	Distortion: DIN 45500
Unipolar 2000	●		16 . . . 22 000 Hz	4 - 8 Ω			103 dB	110 dB		25 V	< 0,1 % 1 kHz	
Unipolar 2002	●		16 . . . 22000 Hz	4 - 8 Ω			109 dB	117 dB		25 V		
HD 430		●	16 . . . 20 000 Hz		600 Ω	per driver 94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,1 W			< 0,5 %
HD 430-9		●	16 . . . 20 000 Hz		600 Ω				0,1 W			< 0,5 %
HD 424		●	16 . . . 20 000 Hz		600 Ω				0,1 W			< 1 %
HD 424-9		●	16 . . . 20 000 Hz		600 Ω				0,1 W			< 1 %
HD 420		●	18 . . . 20 000 Hz		600 Ω				0,1 W			< 1 %
HD 420-9		●	18 . . . 20 000 Hz		600 Ω				0,1 W			< 1 %
HD 414		●	20 . . . 20 000 Hz		600 Ω				0,1 W			< 1 %
HD 414-9		●	20 . . . 20 000 Hz		600 Ω	per driver 94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,1 W			< 1 %
HD 400		●	20 . . . 18 000 Hz		600 Ω				0,1 W			< 1,2 %
HD 400-9		●	20 . . . 18 000 Hz		600 Ω				0,1 W			< 1,2 %
HD 410		●	20 . . . 18000 Hz		600 Ω	94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,1 W			< 1,2 %
HD 40		●	22 . . . 18000 Hz		600 Ω	90 dB at 1 mW ≙ 0.77 V on 600 Ω			0,1 W			ca. 1,5 %
HD 40 TV		●	22 . . . 18000 Hz		120 Ω	93 dB at 1 mW per driver ≙ 0.49 V on 120 Ω			0,1 W			ca. 1,5 %
HD 40 TV Stereo		●	22 . . . 18000 Hz		170 Ω	93 dB at 1 mW ≙ 0.41 V on 170 Ω			0,1 W			ca. 1,5 %
HD 412		●	20 . . . 20 000 Hz		600 Ω	per driver 94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,1 W			< 1 %
HD 4004		●	100 . . . 6 000 Hz		17 Ω	94 dB (1 Pa) at 0.5 V on 17 Ω			150 mW			
HD 230		●	10 . . . 30000 Hz		600 Ω	per driver 94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,2 W			< 0,3 %
HD 224 x		●	16 . . . 20 000 Hz		200 Ω	per driver: 94 dB (1 Pa) at 1 mW ≙ 450 mV on 200 Ω			0,5 W			< 1 %
HD 222		●	16 . . . 20 000 Hz		600 Ω	per driver 94 dB (1 Pa) at 1 mW ≙ 0.77 V on 600 Ω			0,2 W			
HD 222-9		●	16 . . . 20 000 Hz		600 Ω				0,2 W			< 1 %
		●										
		●										
		●										
		●										

4 Technical Data – Headphones

Model	Headband pressure	Weight	Cable	Coupling to the ears * see explanations	Remarks
Unipolar 2000	ca. 4,5 N		Two "unipolar 2000/2002" can be connected to each control box	open principle *	Overmodulation indicator: 1 LED per channel Push button selecter loudspeaker/phones max. 5 A, e. g. 100 W on 4 Ω Volume control: one output jack may be dampened by 6 or 12 dB
Unipolar 2002				circumaural	
HD 430	ca. 4 N	ca. 194 g (without cable)	3 m steel cable with loudspeaker plugs	circumaural, open	
HD 430-9	ca. 4 N		85 cm long cable, extends to 170 cm	circumaural, open	
HD 424	ca. 2,8 N	ca. 120 g (without cable)	3 m steel cable with stereo phone plug	supraaural *, open	
HD 424-9	ca. 2,8 N		85 cm long cable, extends to 170 cm	supraaural *, open	
HD 420	ca. 3 N	ca. 129 g (without cable)	3 m steel cable with loudspeaker plugs	supraaural *, open	
HD 420-9	ca. 3 N		85 cm long cable, extends to 170 cm	supraaural *, open	
HD 414	ca. 2,8 N	ca. 73 g (without cable)	3 m steel cable with loudspeaker plugs	supraaural *, open	
HD 414-9	ca. 2,8 N		85 cm long cable, extends to 170 cm	supraaural *, open	
HD 400	ca. 2,8 N	ca. 80 g (without cable)	3 m steel cable with loudspeaker plugs	supraaural *, open	
HD 400-9	ca. 2,8 N		85 cm long cable, extends to 170 cm	supraaural *, open	
HD 410	ca. 2,8 N	ca. 80 g (without cable)	3 m steel cable with loudspeaker plugs PX	supraaural *, open	
HD 40	ca. 1,3 N	ca. 60 g (without cable)		supraaural *, open	
HD 40 TV	ca. 1,3 N		7 m steel cable with loudspeaker plugs PX	supraaural *, open	Mono-headphones with volume control HD 40 TV-6 same as HD 40 TV, but with jack plug 3.5 mm
HD 40 TV Stereo	ca. 1,3 N			supraaural *, open	Stereo-headphones with volume control
HD 412		ca. 105 g (without cable)	45 cm long coiled cord, extends to 130 cm	supraaural *, open	
HD 4004		ca. 16 g (without cable)	7.5 m long cable with loudspeaker plugs	open air, hooked into ears	
HD 230	ca. 4 N	ca. 260 g (without cable)	3 m steel cable with loudspeaker plugs	circumaural *, sealed	
HD 224	ca. 4 N	ca. 252 g (without cable)	3 m steel cable with loudspeaker plugs	circumaural *, sealed	
HD 222	ca. 4 N	ca. 250 g (without cable)	3 m steel cable with loudspeaker plugs	circumaural *, sealed	
HD 222-9	ca. 5 N		85 cm long cable, extends to 170 cm	circumaural, geschlossen	

5 WIRELESS INFRARED TRANSMISSION SYSTEMS

Infraport

In this novel transmission system for both speech and music, invisible and totally harmless infrared light is used as the carrier. The infrared light is modulated with one or more auxiliary carriers which are modulated by the various audio channels. The infrared light is emitted by semiconductor diodes. The quantity of diodes being governed by the size of the room to be supplied. Normally the transmitting part of the sound system is mains-powered.
At the receiver end portable, battery powered units are employed in which the incoming infrared light is transformed by semiconductor diodes into an electrical signal. After further processing the demodulated audio frequency signal is fed to earphone or similar transducer.

Confinement to the room of your choice
As with visible light, infrared light cannot penetrate walls, so that transmission is confined within a given room. Consequently it is possible to operate the same frequencies in adjacent rooms in parallel without any mutual interference. The specific limitation of infrared transmission to one room ensures the frequently required privacy which is not obtainable with other wireless systems.

Monaural transmission
The first infrared sound systems were designed for single-channel audio transmissions. This first application comprised transmission of the single-channel TV sound from the TV receiver to wireless headphones. The solution we have evolved is to employ a wideband transmission using a carrier of 95 kHz. The frequency modulation principle employed ensures the high quality characteristics which are also familiar to you from regular FM radio broadcasting. This development was followed by more powerful transmission facilities which opened up the use of mono transmission for sound in theatre performances, for the hard of hearing and for delivering clean sound direct to individual listeners in the dissemination of recorded or broadcast information.

Stereophonic systems
A two-channel system was created as a logical further development of wideband mono transmission. The 95 kHz carrier which has already been introduced in mono systems has continued to be used for the left-hand channel of the stereo broadcast, whereas a new carrier of 250 kHz was established for the additional right-hand channel. As with the mono system, this system has also been adopted in West German standard specifications. The second channel is treated in the same way as the first, so that they do not mix. Consequently the system is not confined solely to use for stereo programmes but can also be employed for two fully independent mono programmes.
In addition to stereo transmissions in the home, applications for the wideband two-channel system lies especially in the professional sector of studio sound production. Here the foldback signal is fed to the musicians without any troublesome tangle of headphone leads. Special versions of stereo systems have been used with success in the training and education of hard of hearing children.

Multi-channel systems
Mono and two-channel transmission systems operate with wideband modulation. Additional channels are required, particularly with major conferences where a number of languages are involved. Each participant wants to be able to select his or her own language. By resorting to narrow-band technology, nine channels are created from the frequency band available, without in any way impairing the high audio quality. The nine channels are at a uniform spacing of 40 kHz between the frequencies of 55 kHz and 375 kHz. These systems are employed for simultaneous interpreting, for cueing purposes in TV studios or, for example, for initial instruction of foreign personnel direct at their workplace.

5 Mono-Infrared Transmitter SI 406

Infrared Wideband Receiver HDI 406 · HDI 408

SI 406

GZS 406

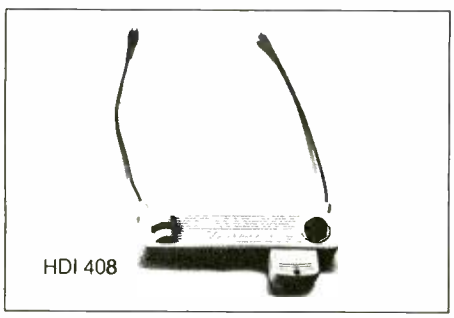
HDI 406

For high-quality monaural transmission.

Infrared transmitter:
Connects to all equipment.
Automatic On/Off circuit.
Automatic modulation.
Flat profile design.

Receiver:
For high quality wideband transmission.
Broad frequency range.
High signal-to-noise ratio.

The SI 406 infrared transmitter is designed for high-quality wireless transmission of one audio channel. With its six infrared transmitting diodes it is suitable for supplying smaller rooms, mainly in the home for transmission of TV sound. It can supply any number of receivers within the irradiated range. This extremely flat-profile transmitter (17 mm) fits on or under any TV set. Connection to the TV or radio set in simply made by plugging the connecting lead into the headphone or loudspeaker output on the set. After connection to the mains socket or headphone jack on the set the transmitter is ready for operation. The infrared wideband HDI 406 receiver, a stethoscope headphone with built-in transducer, is for use with the SI 406 transmitter. This is the most frequenctly used infrared headphone.
An alternative is the HDI 408, a monaural receiver for direct connection to Sennheiser headphones. All infrared receivers incorporate individual volume controls. The headphone receivers are powered via plug-in rechargeable batteries (GZS 406) which can be recharged directly from any mains socket. For larger installations with several infrared headphones a recharge bar GZL 406 with 22 individual compartments is available. The transmitters and receivers described on this page can be modified for the special requirements of the hard of hearing. The description and range of HDI 407 S receivers will be found on page 115.



HDI 408

HDI 408 (Part No. 1380)
As HDI 406 but without built-in acoustic transducer. Suitable for headphones HD 414/HD 424/HD 224/HD 420/HD 430. Frequecy response 100 to 10,000 Hz. Suitable for connection with other headphones with an impedance ≧ 50 Ohms by means of 2.5 mm jack connector.

Technical Data: **HDI 406** (Part No. 1299)

Number of channels	1
Carrier frequencies	95 kHz
Modulation	FM
Deemphasis	50 µs
Peak deviation	± 50 kHz
Acoustic system	Dynamic transducer with acoustic leads to the ear (Stethoset principle)
Frequency response	50 to 8,000 Hz
Maximum sound pressure (1 kHz)	106 dB
Distortion factor at 1000 Hz and ± 50 kHz deviation	≦ 3 %
Signal to noise ratio to (DIN 45 405)	≧ 50 dB
Power source	Rechargeable plug GZS 406 2.3 to 2.6 V
Operating life with one battery	approx. 15 hours to complete exhausition approx. 5 hours in daily use
Weight	65 g

Rights reserved to adopt modifications, especially in the course of technological progress.

Technical Data: **SI 406** (Part No. 1314)

Colour	Matt-black
Dimensions	approx. 200 x 80 x 17 mm
Power supply	220 V, 30 – 60 Hz, approx. 5 W
Carrier frequency	95 kHz
Modulation	FM
Frequency response	± 50 kHz
Preemphasis	50 µs
LF band width	40 to 15,000 Hz
Distortion factor	≦ 2 %
Dynamics	The dynamics originating from the TV sound remain intact.
Wave length of the infrared light radiation	950 nm

Rights reserved to adopt modifications, especially in the course of technological progress.

5 **Stereo Transmitter** SI 234 "HiDyn" and **Stereo Receiver** HDI 234 "HiDyn"

Radiator SZI 434

SI 234 »HiDyn«

HDI 234 »HiDyn«

Transmitter:
With "HiDyn" compander system.
Wireless hi-fi stereo transmission.
Suitable for connection to all equipment.
LED modulation control.
High channel separation.
Increased output through radiator.
Small and elegant design.

Receiver (headphone):
With "HiDyn" compander system.
Secure seating and high wearing comfort.
Circumaural ear cushions.
High volume output.

The SI 234 "HiDyn" transmitter is designed for wireless hi-fi infrared audio transmission. Its 12 diodes ensure adequate coverage of normal-size residential rooms. The SZI 434 radiator is available for highter requirements.
The SI 234 transmitter is suitable for connection to virtually all sound sources. The input audio-frequency voltage is set at optimum level with the aid of the LED modulation control. The stereo signal is converted in accordance with standard specifications and radiated as infrared light via the 12 transmission diodes. The unit is powered by means of a plug-type mains unit.
The HDI 234 "HiDyn" is available as hi-fi stereo infrared headphone.
The circumaural cushion of the HDI 234 "HiDyn" ensures a secure fit and high standard of wearing comfort. The compander system ensures a high quality of transmission and enhanced range. Two precisely separated channels, switchable for monaural channel 1, monaural channel 2 and volume slide control separately for right and left also permit precise balance adjustment as well as the facility to hear through separate channels. The headphone can be operated optionally by dry cell or rechargeable battery.

The transmitter and receiver are fitted with the "HiDyn" noise suppression system. Without "HiDyn" and under otherwise optimum conditions a signal-to-noise ratio of approx. 60 dB could be achieved whereas with the "HiDyn" it is possible to achieve a value of 72 dB. As with all compander processes, with the "HiDyn" system linear predistortions can be obtained relative to a level which are cancelled out on reproduction in the receiver.

If the output of the SI 234 "HiDyn" transmitter is inadequate in larger rooms, it can be increased by use of the SZI 434 stereo radiator. Naturally additional transmitters can be connected via adapters if this is rendered necessary by the size of room. The power supply is via the plug-in mains unit of the respective transmitter.

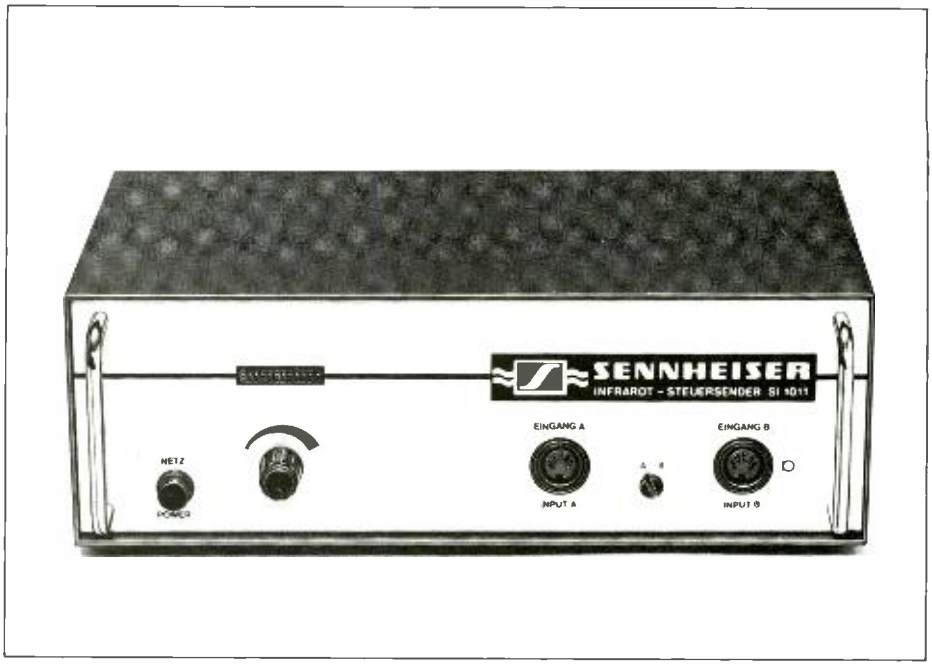
Technical Data	**SI 234 "HiDyn"**
Frequency response	20 to 20,000 Hz
Modulation mode	FM
Carrier frequency	95 kHz/250 kHz
Peak deviation/rated deviation	± 50 kHz/± 35 kHz
Deemphasis	50 µsec.
Input voltage for rated deviation	1.5 V
Input impedance	330 kΩ
Noise factor at 1000 Hz and rated deviation	< 1 %
Signal to noise ratio with HiDyn and HDI 234	approx. 65 dB to DIN 45 405
Service voltage	220 V/50-60 Hz, approx. 10 W
Weight	Transmitter: approx. 260 g Mains unit: approx. 330 g

SZI 434

Technical Data	**HDI 234 "HiDyn"**
Frequency response	20 to 20,000 Hz
Modulation mode	FM
Carrier frequency	95 kHz/250 kHz
Peak deviation/rated deviation	± 50 kHz/± 35 kHz
Preemphasis	50 µsec.
Acoustic system	Dynamic transducer
Noise factor at 100 Hz and rated deviation	< 1 %
Service voltage	9 V drive cell IEC 6 F 22
Weight	approx. 380 g
Mode of wearing	Circumaural
Maximum volume level	approx. 110 dB
Colour	black

5 Monaural Transmitter System

Control Transmitter SI 1011 with Infrared Radiator SZI 1011 Infraport



For high-quality monaural transmission.
Modular assembly principle.
For large rooms.
Additional microphone input.
Modulation indicator and limitor amplifier.

The mains-operated SI 1011 mono infrared control transmitter offers an economical solution for use in larger rooms. For this purpose it can be coupled with a large number of infrared radiators, 8 SZI 1011 units can be connected directly to the SI 1011, providing sufficient output to service a large room of up to 400 m^2 in area. Additionally the system can be expanded with the aid of supplementary mains units and high performance radiators virtually without restriction. Detailed information on further modular units and examples for planning different systems will be found in further Sennheiser publications.
The SI 1011 control transmitter incorporates two asymmetric audiofrequency inputs: one high-level input and one microphone input. A selector switch permits either of these inputs to be selected. An LED modulation indicator simplifies lining up on the transmitter unit and a high-quality limiting amplifier prevents overmodulation in the event of excessive input levels. The SZI 1011 radiators are connected to the output of the SI 1011 by means of the leads available as accessories. These infrared radiators (SZI 1011) have been optimised for the specific requirements involved in monaural operation. They incorporate 12 transmitting diodes for infrared light and an additional red LED as an operating indicator. A $^3/_8$" thread has been used to facilitate mounting on brackets and stands.

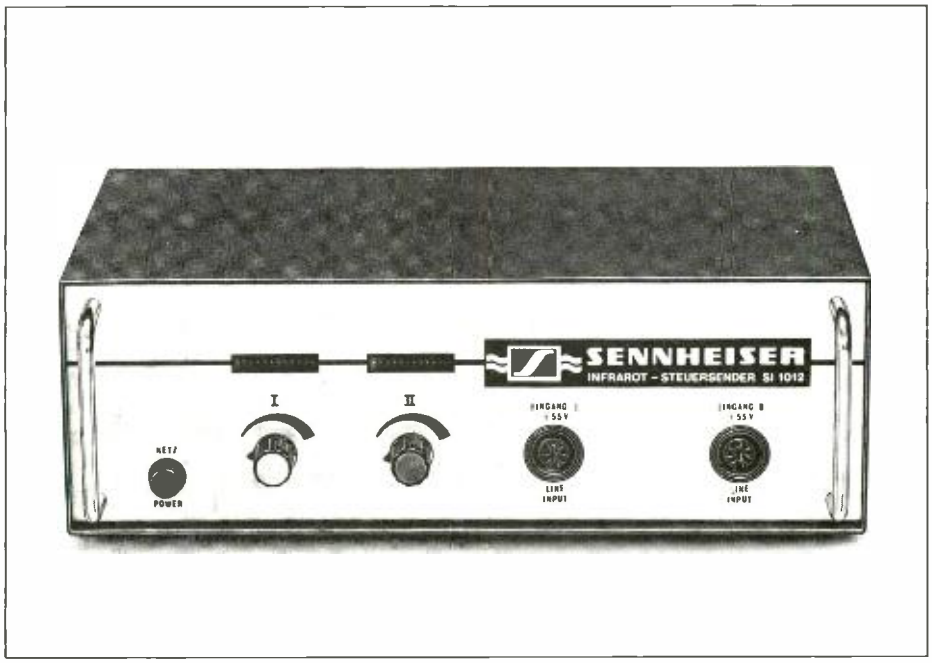
SZI 1011

Technical Data:

	SI 1011 (Part No. 1547)
Transmission frequency	95 kHz
Modulation	FM
Rated deviation	± 40 kHz
Peak deviation	± 50 kHz
Deviation display	LED
Interference deviation	
for high-level input	40 Hz
for microphone input	100 Hz
Inputs:	
a) High level.	
Sensitivity for peak deviation	adjustable from 30 mV to 3 V
Impedance	10 kΩ
Audiofrequency transmission range (– 3 dB)	20 to 20,000 Hz
Noise factor	≦ 1 %
b) Microfone input for dynamic 200 Ω microphones	
Sensitivity for peak deviation	0.4 mV
Audiofrequency transmission range	50 to 15,000 Hz
Noise factor	≦ 1 %
Outputs:	
Service voltage	32 V
Maximum current for radiator	1.2 A
Radio frequency level	approx. 700 mV_{eff} to 60
2 identical output jacks for switchcraft plug connector type A 4 M or Cannon type XLR-4-12 C	1 = radiofrequency 2 = earth 3 = – power supply 32 V 4 = +
Power supply	220 V (110 V resolderable)
Fuse	0.8 A semi time lag
Power consumption	maximum 60 W
Dimensiona in mm	295 x 200 x 107
Weight	approx. 5 kg
	SZI 1011 (Part No. 1548)
Input level	300 to 1000 mV
Operating frequency	95 kHz
Frequency range	10 kHz to 180 kHz (– 3 dB)
Input impedance	approx. 25 kΩ
Wavelength of emitted infrared light	950 nm
Radiated power	approx. 100 mW
Service voltage	27 to 34 V
Power consumption	approx. 130 mA
Operated pilot lamp	red LED
Housing dimensions	200 x 80 x 23 mm
Length of connecting lead	3 m
Connecting plug	Tuchel No. T 3360-002 or appropriate plug connector No. 09-0013-00-05 4 = RF, 2 = screening, = –, 5 = + U_B
Weight	approx. 450 g

5 2-Channel Infrared System with Control Transmitter SI 1012 and Radiator SZI 1012

Infraport



For high-quality 2-channel transmission.
Modular assembly system.
For large rooms.
Symmetrical inputs.
Modulation indicator.
Limiting amplifer.

The mains-powered SI 1012 2-channel infrared control transmitter offers an economical solution for large systems. It can be coupled with a large number of infrared radiators, for example up to 8 SZI 1012 radiators can be linked directly by appropriate connecting leads with the transmitter. This is adequate to cover areas of up to 200 m^2 and a wide variety of applications. Furthermore, virtually unlimited expansion is possible by using supplementary mains units and radiators.

Additional information on individual modular units and on the planning of large-scale systems is to be found in detailed Sennheiser publications on the infrared range (available on request).

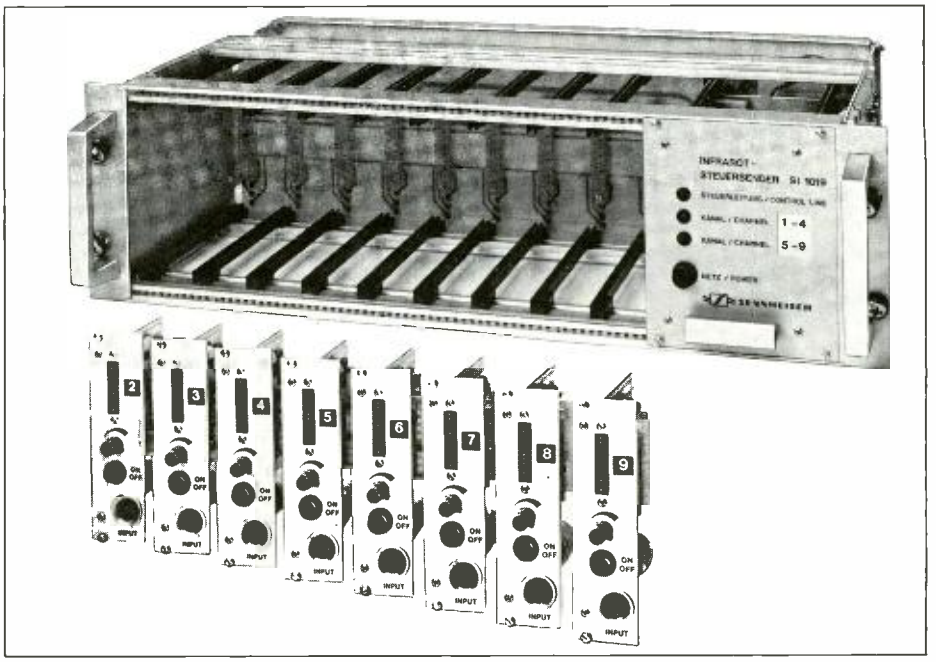
The SI 1012 control transmitter has two symmetrical inputs of equal value. Both channels can be modulated independently of each other and have their own LED modulation indicators. A high-quality limiting amplifier in each channel prevents overmodulation up to a high input level.

Each channel can be switched of individually, allowing the transmitter to operate as a monaural control unit as well. Appropriate connecting leads link the SZI 1012 radiator to the output of the SI 1012. These radiators have been optimised for the specific requirements of stereo operation. They incorporate 12 transmission diodes for infrared light and an additional red LED to act as a pilot indicator. A $^3/_8$" thread is provided for mounting on brockets and stands.

SZI 1012

Technical Data:	**SI 1012** (Part Nr 1410)
Transmission frequencies	95 kHz and 250 kHz, can be switched on separately
Modulation	FM
Rated deviation	± 30 kHz
Peak deviation	± 40 kHz
Deviation indication	LED line for each channel
Interference deviation	40 Hz
Inputs	
Sentivity for peak deviation	60 mV 3 V adjustable
Impedance	10 kΩ
Audifrequency transmission range	20 to 20,000 Hz
Noise factor at 1 kHz and 30 kHz deviation	≦ 1 %
Outputs	
Service voltage for radiator	32 V
Maximum current for radiator	1.2 A
RF level	approx. 700 mV_{eff} to 60 Ω
2 identical output sockets for switchcraft type A 4 M plug or Cannon type XLR-4-12 C plug	1 = RF 2 = earth 3 = $^-_{32}$ V 4 = +
Power supply	220 V (110 V, changed solder bridge)
Fuse	0.8 A semi timelag
Power consumption	60 W
Dimensions in mm	295 x 200 x 107
Weight	approx. 5 kg

Technical Data:	**SZI 1012** (Part No 1490)
Input level	20 mV to 700 mV
Frequency range	40 kHz to 400 kHz
Input impedance	approx. 4 kΩ
Wavelength of emitted infrared light	950 nm
Emitted power	approx. 110 mW
Service voltage	29 to 34 V
Power consumption	145 mA
Operation monitor	by red LED
Housing dimensions	200 x 80 x 23 mm
Length of connecting lead	3 m
Connectors	Tuchel No. T 3360-002 or appropriate binder No. 09-0313-00-05 1 = RF, 2 = screen, 3= –, 5= + dc
Weight	approx. 450 g



High-quality sound transmission.
Up to 9 channels.
Modular assembly principle.
Symmetrical AF inputs.
Limiting amplifier.
Modulation indicator.

The IR system 1019 permits simultaneous transmission of up to 9 audio channels. Use is made of the narrow-band system in which the individual channels lie between 55 kHz and 375 kHz. The central control transmitter is assembled from the range of modules available. The picture above shows an example of the SI 1019 assembled with 9 channels comprising the SIK 1019, chassis SIC 1019-20 and housing SIG 1019.
The SIK 1019 channel modules are fitted with input jacks, input transformer, sensitivity regulator, control amplifier, modulation indicator, modulator, decoupling network and On/Off switch.

The SIC 1019-20 chassis serves as the carrier of the SIS 1019-20 power supply module and incorporates the mains unit, the central mains switch, displays to indicate functioning of the dc voltage supply and the summing amplifier and output connection.
The SIG 1019 housing is constructed of sturdy sheet steel. It is used whenever the chassis cannot be installed in 19" frames. The SIB blanking panels are used to cover unused positions. The complete transmission system comprises of a control transmitter assembled from the modules as described in conjunction with a radiator and any additional main units which may be necessary. The SZI 1019 high performance radiator should be used ideally as the emitter unit. The EKI 1019 9-channel receiver is available for the receiver system.

Applications for multi-channel infrared systems extend all over the communications industry. The most important area of use is in high quality simultaneous interpretation systems, where there is usually a large number of receivers in use with one transmitting system. A further application, in which relatively few receivers are employed, is in cueing systems, for example, stage direction and TV studios. The modular assembly principle renders this system adaptable for a wide range of different applications. To assist in this connection Sennheiser offers supplementary information in the form of leaflets and brochures for planning engineers.

The SI 1019 is available in the following modules:

SIC 1019-20 (Part No. 1862)
19" Chassis with mains module.

SIS 1019-20 (Part No. 1863)
Power supply module.

SIK 1019, Channel 2 (Part No. 1744)
Channel module, 95 kHz.

SIK 1019, Channel 3 (Part No. 1745)
Channel module, 135 kHz.

SIK 1019, Channel 4 (Part No. 1746)
Channel module, 175 kHz.

SIK 1019, Channel 5 (Part No. 1747)
Channel module, 215 kHz.

SIK 1019, Channel 6 (Part No. 1748)
Channel module, 255 kHz.

SIK 1019, Channel 7 (Part No. 1749)
Channel module, 295 kHz.

SIK 1019, Channel 8 (Part No. 1750)
Channel module, 335 kHz.

SIK 1019, Channel 9 (Part No. 1751)
Channel module, 375 kHz.

SIB 1019 (Part No. 1752)
Blanking panel

Technical Data: **9-channel control transmitter**

Number of channels	9 (channels switchable individually)
Transmission frequencies	55 to 375 kHz in 40 kHz raster pattern
Modulation	FM
Nominal deviation	± 6 kHz
Peak deviation	± 7 kHz
Preemphasis	100 ms
Modulation indication	LED line
Deviation limiting	by limiting amplifier
AF inputs	symmetrical
Input impedance	10 kΩ
Input sensivity	adjustable 60 mV to 3 V
AF frequency response	50 to 7000 Hz
Noise factor at 1 kHz and 6 kHz deviation	3 %
RF output voltage	2 V_{SS}
HF output impedance	60 Ω
Output dc	32 V
Maximum output dc	1.2 A
Power supply	220 V (110 V resolderable)
Power consumption	maximum 70 W
Dimensions in mm (19" chassis with enclosing housing)	approx. 495 x 260 x 135.5

Rights reserved to adopt modifications, especially in the course of technological progress.

5 3-Channel Simultaneous Interpretation System

System 1019 (3-Channel)

Infraport

TSR 1019
Control Box

TSI 1019
Interpreter Station

With increasing frequency people of various nationalities are gathering to exchange ideas and to learn from each other. In industry this can involve conferences and training courses for foreign agents and their service personnel, in the public service and health field this can involve conferences, conventions and symposia. All participants should ideally be able to follow events and speakers in their own language.

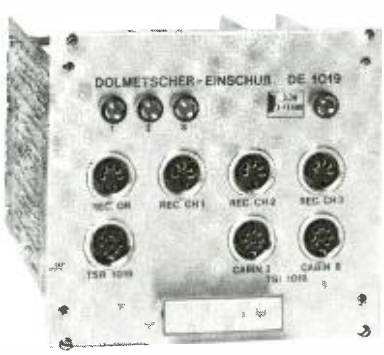
For these smaller conferences the conventional simultaneous interpretation systems are frequently too comprehensive, especially where the need is only for two or three languages. However, it is just such smaller conferences which are the more frequent, as we have established in a special survey carried out by Sennheiser.
This broad range of applications is covered by the Sennheiser system 1019 infrared 3-channel simultaneous interpreting system. The system consists of individual modular groups which can be combined to customer specifications. Use of the very latest system modules guarantees rapid and simple assembly and efficient handling.
As a result this particular system can never be described as too big.

The 3-channel simultaneous interpreting system is assembled as required. The Summary shows which basic modules are essential:

1. Control transmitter including mains unit,
   1 interpreter module,
   4 infrared transmitter modules.
   A fifth module is provided as spare.
2. The control station (TSR 1019).
3. 2 interpreter stations (TSI 1019) with 4 headphone/microphone sets (HMD 414-19) or HME 1019 including a connecting lead for the interpretation system.
4. 1 high performance radiator with connecting lead, For larger rooms it is possible to interlink several radiator (1 radiator per 100 m^2 approx.).
5. Receivers according to number of listeners (EKI 1019).
6. Headphones according to model with earclips or stethoscope, as required according to number of listeners.

HMD 414-19

HME 1019



DE 1019 Interpreter Module

Technical data:

Dimensions:

Interpreter module DE 1019 (WxHxD)	142 x 129 x 181 mm
Interpreter stations/control box TSR/TSI 1019	72 x 125 x 230 mm

TSR 1019 control box

Microphone connecting socket	8-pin, to DIN 45 326
Input impedance	200 Ohms balanced
Connections: Microphone	pins 1 and 3
Electret microphone powering	pin 8
Supply voltage for electret microphone	12 V
Line connecting socket	5-pin to DIN 41 524
Input impedance	100 kOhms balanced
Connections	pins 1 and 3
Input level	100 mV to 3 V

TSI 1019 Interpreter Station

Headphone/microphone set connecting socket	8-pin to DIN 45 326
Input impedance	200 Ohms
Connections: microphone	pins 1 and 3
headphone	pins 4 and 5
powering for electret microphone	pin 8
Supply voltage for electret microphone	12 V
Headphone impedance	= 200 Ohms
Connections	pins 4 and 5

5 High Power Radiator SZI 1019 and Mains Unit GZN 1019

Infraport

SZI 1019

For large-scale systems.
Lightweight radiator.
High radiated output.
Optimum modulation at all times.
4 radiators per mains unit.
Mains unit remote control.

The SZI 1019 infrared high performance radiator is designed for infrared radiation in very large rooms. It accepts the RF signals with their imposed sound modulation from the control transmitter. These signals are then transformed to the power required to operate its 119 infrared transmitter diodes. A red LED serves as the operating indicator. Beyond its use in multi-channel operation, the radiator is also ideal for use with large-scale mono and 2-channel systems. One high performance radiator can be powered direct from the integral mains unit of the infrared control transmitter. As several radiator are normally used in large-scale systems, additional mains units GZN 1019-1 are available. Irrespective of the number of channels to be driven, the radiators always supply the maximum light output. As one diode is required for each channel and for every 2 m^2, this light output is sufficient, for example, for driving 4 channels over an area of approx. 60 m^2. Four SZI 1019 high performance radiators can be supplied from each GZN 1019-1 mains unit. As it is preferable for the mains unit to be set up separately in the vicinity of the radiator, the mains unit can best be remote controlled from the control transmitter. The electronics system employed in the mains units is designed to allow easy wiring of even larger systems. The mains unit is cooled by convection and therefore requires no maintenance. The GZG 1019 bracket mount is frequently used for securing the high performance radiator. This arm is not included as standard equipment.

GZG 1019

GZN 1019

Technical Data: **SZI 1019** (Part No. 1612)

Frequency response	40 to 400 kHz
Input impedance	4 kΩ
Number of transmitter diodes	119
Average current through a transmitter diode	100 mA
Total mean infrared radiation output	approx. 1800 mW
Operating indicator	by red LED
Service voltage	29 to 34 V
RF input voltage	20 to 700 mV, maintained at optimum modulation by automatic gain control
Power consumption	1.1 A
Dimensions with mounting stirrup	350 x 220 x 45 mm
Weight	1500 g

Rights reserved to adopt modifications, especially in the course of technological progress.

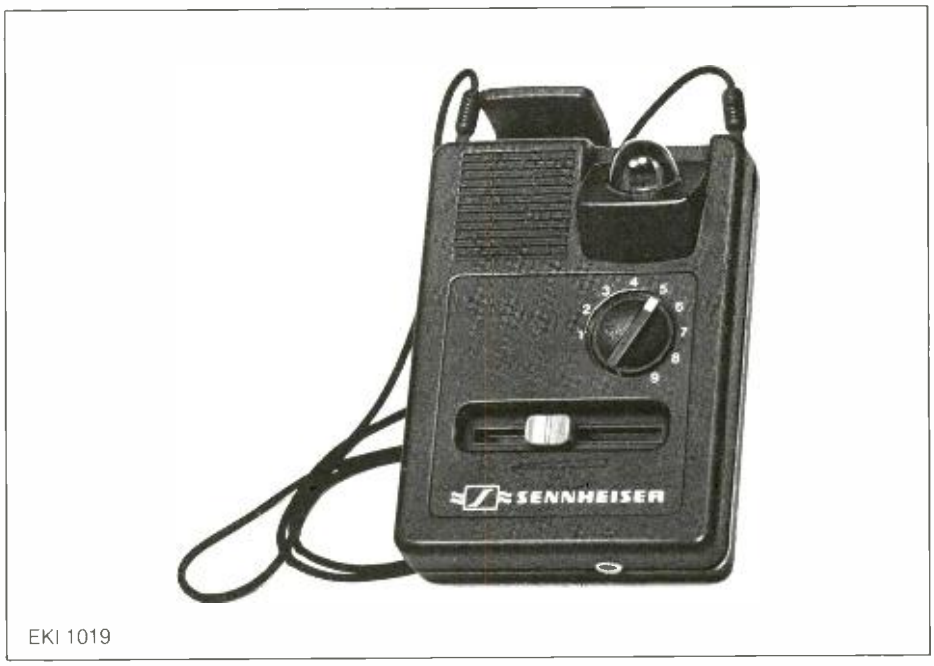
Technical Data: **GZN 1019** (Part No. 1609)

Mains voltage	220 V/110 V ac
Power consumption	max. 250 VA
Output voltage	33 V
Max. output current	4.5 A
Dimensions in mm	260 x 160 x 160
Weight	approx. 7.5 kg

Rights reserved to adopt modifications, especially in the course of technological progress.

5 9-Channel Receiver EKI 1019 and Charger Unit EZL 1019

Infraport



EKI 1019

Receiver band width 50 to 8,000 Hz.
High channel separation.
Compact and rugged, receiver weight only 120 g.
Economical rechargeable battery operation.
Portable charger unit doubled as carrying case.
Space for 106 units.
Built-in test compartment

The small, lightweight EKI 1019 9-channel infrared receiver is both convenient and rugged. It can be worn with either a clip or round the neck by lanyard. The power supply is from a built-in nickel cadmium rechargeable battery allowing an uninterrupted operating time of about 13 hours. The receiver is switched on by simply plugging in the headphone lead jack. Three different types of headphone are available as standard, HD 400-6, TC 2-26, TC 2-36 with 3.5 mm jack connector. The required channel can be selected by means of a 9-channel switch. The volume can be regulated by means of the horizontal slide potentiometer.

All controls are recessed into the housing to reduce accidental alteration of setting. The EZL 1019 charger unit permits simultaneous charging of 105 EKI 1019 receivers. A timer is provided for the charging period. A completely flat infrared receiver battery requires about 14 hours for full recharge. The unit switches over to trickle charge automatically when the preset charging time expires. A separate test compartment is provided in the charger to check the service voltage of the receiver. The suitcase design is particularly useful for mobile operation of the complete Sennheiser infrared multi-channel system.

EZL 1019

TC 2-26

TC 2-36

HD 400-6

Technical Data: **EKI 1019** (Part No. 1523)

Number of channels	9
Receiving frequencies	55 to 375 kHz in 40 kHz raster pattern
Channel selection	rotary selector switch
Modulation mode	FM
Nominal deviation	± 6 kHz
Peak deviation	± 7 kHz
Deemphasis	100 µs
Operating mode	Super heterodyn
IF	455 kHz
Demodulation principle	Synchronous demodulation
Audio amplifier	Push-pull, short circuit proof
Output impedance	100 Ω
Permissible loading	magnetic or dynamic headphones 200 to 2 000 Ω
Output socket	3.5 mm jack connector
Max. level at 200 Ω load resistance (5 % distortion, 1 kHz, 4.5 V battery supply)	0.9 V
Max. level at 1 kΩ load resistance (5 % distortion, 1 kHz, 4.5 V battery supply)	1.2 V
Noise factor at 7 kHz deviation (f = 1 kHz, load = 200 Ω, battery voltage = 4.5 audio voltage = 0.7)	max. 4 %
Audiofrequency range	50 to 8,000 Hz
DIN signal to noise ratio	40 dB
Channel separation	> 40 dB
Power supply	Rechargeable battery 4.8 V/50 mAh
Operating time with one battery charge	approx. 13 hours
Weight	120 g
Dimensions in mm	approx. 95 x 70 x 20
Colour	matt-black

Rights reserved to adopt modifications, especially in the course of technological progress

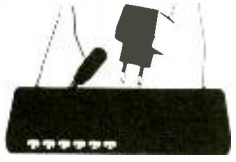
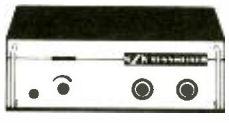
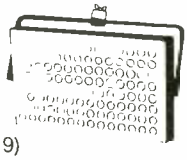
Technical Data: **EZL 1019** (Part No. 1613)

Number of charging compartments	106, 1 test compartment
Charging current	5 mA
Test current	25 mA
Charging time for empty battery	14 hours
Power supply	110/220 V
Power consumption	approx. 20 W
Dimension in mm	740 x 550 x 180
Weight	approx. 30 kg

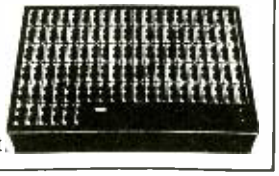
Rights reserved to adopt modifications, especially in the course of technological progress

5 WIRELESS INFRARED TRANSMISSION – ACCESSORIES

Infraport Transmitters

		Accessories
Mono	**SI 406** Home TV sound transmitter  **SI 1011** Control transmitter 	**SZI 1011** (Emitter)  **GZL 1012** (4-way connecting and extension lead)
Stereo/ 2-channel	**SI 234 HiDyn**  **SI 1012** Control transmitter 	**SZI 434** Slave emitter for **SI 234 HiDyn**  **SZI 1012** (Emitter)  **GZL 1012** (4-way connecting and extension lead) **SZI 1019** (Infrared high performance emitter)  **GZN 1019-1** (mains unit for SZI 1019) **GZL 1019, GZL 1019-1, GZL 1019-2** (Control leads for SZI 1019 and GZN 1019) **GZG 1019** (articulated joint for SZI 1019)
Multi-channel	**System 1019** **Multi-Channel System** (transmitter) 	

Infraport Receivers

		Accessories
Mono	**HDI 406** (Stethoscope receiver)  **HDI 408** (Stethoscope receiver) **HDI 234 HiDyn** (headphone receiver, also for mono) 	**GZS 406** Rechargeable plug 
Stereo/ 2-channel	**HDI 234 HiDyn** open hi-fi headphone 	
Multi-channel	**EKI 1019** (9-channel narrow band receiver) 	**EZL 1019** battery charger unit **HD 400-6** Monaural headphone **TC 2-26** Dynamic teleclip combination **TC 2-36** Dynamic earphone with earmount. 

5 Infrared Headphones with Transmitter– Technical Data

Model	Frequency response	Modulation mode	Carrier frequency	Frequency deviation/ peak deviation/ nominal deviation	Deemphasis	Preemphasis	Acoustic system	Input level for nominal deviation	Input impedance throughout range	Noise factor at 1000 Hz	Service voltage, power consumption
HDI 406	50 . . . 8 000 Hz	FM	95 kHz	± 50 kHz	50 µs		Dynamic transducer			≦ 3 % (± 40 kHz Hub)	2,3 bis 2,6 V
SI 406	40 . . . 15 000 Hz (– 3 dB)	FM	95 kHz	± 50/25 kHz		50 µs		0,04 . . . 20 V	≧ 5 kΩ	≦ 1 % (± 25 kHz Hub)	220 V/50 – 60 Hz, ca. 5 W
HDI 234	20 . . . 20 000 Hz	FM	Left channel: 95 kHz	± 50/	50 µs		Dynamic transducer			≦ 1 % (± 35 kHz Hub)	9-V-transistor battery IEC 6 F 22
SI 234	20 . . . 20 000 Hz	FM	Right channel: 250 kHz	± 35 kHz		50 µs		1,5 V	330 kΩ	≦ 1 % (± 35 kHz Hub)	220 V/50 – 60 Hz ca. 10 W

Model	Weight/ Dimensions	Finish	Coupling to ears	Maximum sound pressure level	S/N ratio DIN 45 405	Remarks
HDI 406	65 g	High impact plastic housing		108 dB		
SI 406	Transmitter: approx. 165 g 200 x 80 x 17 mm Transformer: approx. 200 g	flat black			≧ 60 dB	SI 406 and SI 406 S: Audio cable and plugs according to DIN 45 327. SI 406 SX: Audio cable with pigtails
HDI 234	ca. 380 g	High impact plastic housing			ca. 65 dB	With "HiDyn" (can be switched off)
SI 234	Transmitter: approx. 260 g Transformer: approx. 330 g	flat black	circumaural	ca. 110 dB	ca. 65 dB	Audio connector according to DIN 45 327 HF synch. output: 1.3 Vpp for SZI 434

6 WIRELESS RF TRANSMISSION SYSTEMS

For more than 20 years Sennheiser has been supplying high quality wireless sound transmission equipment. Depending on the transmission power employed a distinction is drawn between wireless microphones and auxiliary broadcasting equipment. Wireless microphones are manufactured in a compact or miniaturised construction and available with outputs of up to 100 mW. Auxiliary broadcasting transmitters are available for outputs of up to 10 W. On the receiver side both battery operated pocket receivers and mains operated stationary receivers are available. Our range of products also includes recharging units for equipment operating with rechargeable cells. To economise on the limited space in the RF spectrum two different systems are available. Wideband modulation produces the highest audio quality but requires a considerable RF range. At a reduced RF band width of 40 kHz it is still possible to achieve high quality transmissions. Sennheiser also market transmitters and receivers in this narrow-bandwidth system. This equipment is popular in theatres in conjunction with multi-channel systems. To enhance the transmission quality in wideband and narrow-band systems, transmitters and receivers can be selected which incorporate the Sennheiser "HiDyn" noise suppression system.

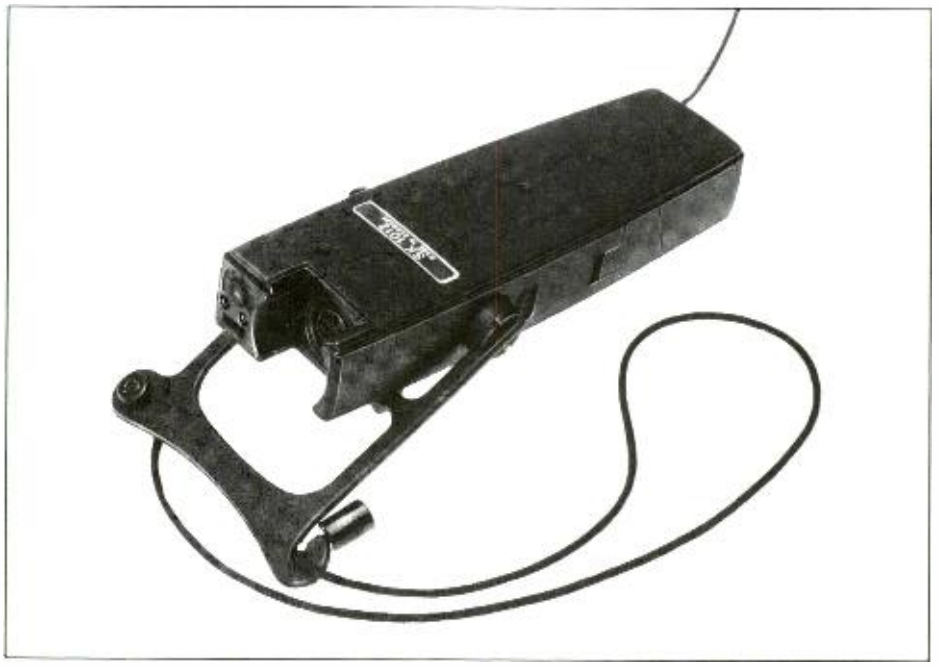
The table is intended to facilitate selection and assembly of Mikroport transmitter and receiver systems. Those items marked with ● are those which can be used direct. In the event of other combination requirements we suggest you contact your Sennheiser After Sales Service Department or Sennheiser agency. There you can also obtain recommendations on resolving wireless microphone transmission problems which it has not been possible to cover within the scope of this table.

Compatibility of Sennheiser Mikroport Transmitters and Receivers

Transmitter \ Receiver	EK 1010, EK 1010-R (30 – 45 MHz) wideband	EK 1010-6 (30 – 45 MHz) narrow-band	EK 1010-8 (pilot tone) (30 - 45 MHz) narrow-band	EM 1001 (30 – 45 MHz) narrow-band	EM 1003 (30 – 45 MHz) wideband	EM 1012, 3 channels (36.7; 37.1; 37.9 MHz) wideband	EM 1012-2, 5 channels (25 – 45 MHz) wideband	EM 1012-4, 5 channels (140 – 210 MHz) narrow-band	EM 1012-5, 5 channels (140 – 210 MHz) wideband	EM 1012-7, 5 channels (30 – 45 MHz) narrow-band	EM 1026 (30 – 45 MHz) wideband	ER 2 (25 – 110 MHz) wideband	ER 2-1 = ER 3 (25 – 110 MHz) narrow-band
SK 1010-R	●												
SK 1010 (30 – 45 MHz)	●												
SK 1010-1 SK 1010-1-R (30 – 45 MHz)		●											
SK 1010-6 (30 – 45 MHz)		●											
SK 1010-7 (30 – 45 MHz)			●										
SK 1010-8 (30 – 45 MHz)													
SK 1010-9 (140 – 200 MHz)								●					
SK 1012 SK 1012-R (30 – 45 MHz)					●	●	●				●		
SK 1012-1 SK 1012-1-R (30 – 45 MHz)					●	●	●				●		
SK 1012-6 (30 – 45 MHz)				●						●			
SK 1012-7 (30 – 45 MHz)				●						●			
SER 1-3 (25 – 110 MHz)												●	●
SER 1-4 (35 – 110 MHz)												●	●
SER 10 (30 – 200 MHz)												●	●

SK 1012

A wide dynamic range through the use of "HiDyn" compander circuitry.
Compact model with clip-on microphone MKE 2012 (omnidirectional) and MKE 4012 (supercardioid).
Optional selection of three operating modes: Linear, Limiter, HiDyn.
Compatible with existing systems.



This SK 1012 transmitter with newly developed compander circuitry for reducing noise levels is a further development of the familiar range of portable Mikroport transmitters. The housing from SK 1010 has been used. The exterior distinguishing feature is the operating mode selector switch with 3 settings:
"Linear"
No regulating control, deviation limited only by clipping.
"Limiter"
Deviation limited by regulating control.
"HiDyn"
Compander mode and deviation limited by regulatory control.
As with all compander processes the "HiDyn" system utilises linear pre-emphasis in the transmitter. Corresponding de-emphasis is used in the receiver. Consequently a "HiDyn"-compatible receiver is also necessary, for example EM 1026, EM 1001 or EM 1003. The standard of noise suppression achieved by the "HiDyn" process is astoundingly good. Whereas without "HiDyn" under otherwise optimum conditions a signal to noise ratio of, for example, 60 dB is achieved, with the "HiDyn" system it is possible to achieve a value of 72 dB (CCIR 468, peak valuation). Where the RF conditions are less than optimum the gain is even greater. As the possibility is not to be excluded that the SK 1012 transmitter may also have to operate together with receivers incapable of coping with "HiDyn", the "HiDyn" system can be switched off by the operating mode switch on the side of the housing. The moulding at the bottom end of the antenna is used as a switching tool. In the "Lim" position the SK 1012 operates in the same manner as the popular SK 1010 transmitter: on exceeding full modulation (rated deviation) an automatic level limiter comes into action. In the "Lin" position the automatic level control is switched off. The AF signal is limited harshly by clipping 5 dB above full modulation level.

The SK 1012 transmitter is available in the following versions:

SK 1012
Mikroport transmitter, with 3 switchable wideband transmission frequencies 36.7/37.1/37.9 MHz and 10 mW RF output.

SK 1012 R
As SK 1012, but for the West German broadcasting stations with frequencies between 32.55 and 38.05 MHz.

SK 1012-1
As SK 1012, but with 100 mW RF output. The higher output reduces the operating time to approx. 30 % by comparison with the SK 1012. This version is licensed only for delivery to foreign countries.

SK 1012-1 R
As SK 1012, but with 100 mW RF output. Owing to the higher output the operating time is reduced to about 30 % by comparison with the SK 1012. This version is designed for German broadcasting stations on frequencies between 32.55 and 38.05 MHz.

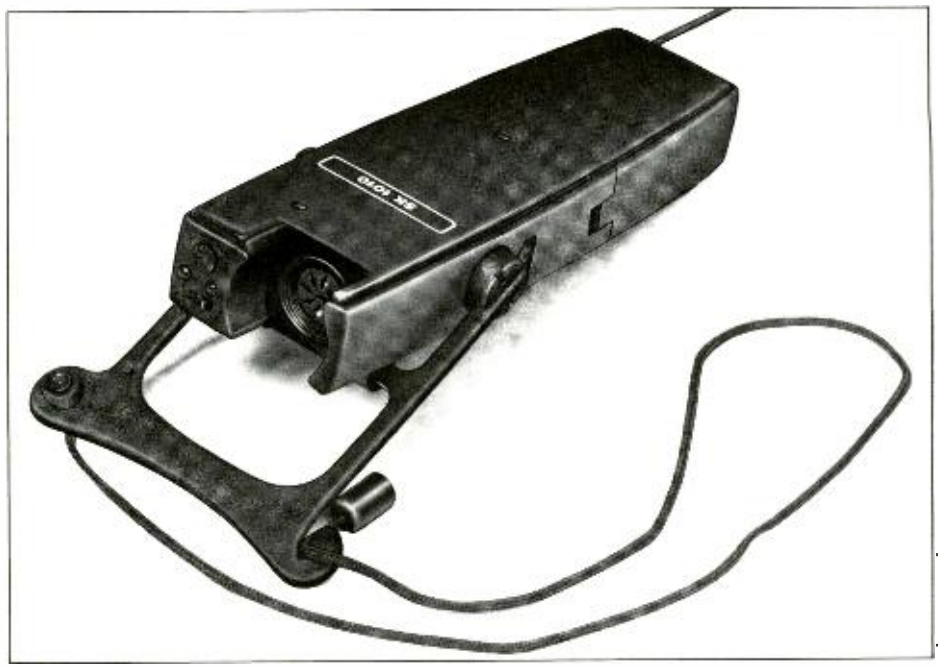
SK 1012-6
Narrow-band version of the SK 1012, 1 frequency in the area of 30 to 45 MHz.

SK 1012-7
Narrow-band version as SK 1012-6, but with 100 mW RF output.

Technical Data:	**SK 1012**	**SK 1012-1**
Carrier frequency	36.7/37.1 and 37.9 MHz (switchable) or 3 frequencies between 30 and 45 MHz	
Max. frequency separation between channel 1 and channel 3	1 5 MHz	1.5 MHz
Frequency stability at temperatures between + 10° C and + 40° C and deviation by + 10 % and – 30 %	better than ± 15 kHz	better than ± 15 kHz
RF output to dummy antenna	10 mW	100 mW
Radiated power	≦ 1 mW	approx. 10 mW
Radiated spurious and harmonic frequencies	≦ 4 nW	≦ 4 nW
Modulation	FM	FM
RF phase position (RF input voltage: frequency deviation)	selective internally by soldder bridge	
Rated deviation	± 40 kHz	± 40 kHz
Peak deviation in operating mode		
linear	± 75 kHz	± 75 kHz
limiter	± 40 kHz	± 40 kHz
HiDyn	± 40 kHz	± 40 kHz
Signal to noise ratio (CCIR 468, peak) relative to rated deviation, input sensitivity 10 mV		
linear	≧ 60 dB	≧ 60 dB
limiter	≧ 60 dB	≧ 60 dB
HiDyn	≧ 70 dB	≧ 70 dB
Input sensitivity		
maximum	1 mV/± 40 kHz deviation(typical)	
minimum	200 mV/± 40 kHz deviation (typical)	
Input impedance	approx. 40 kΩ	approx. 40 kΩ
Input socket wiring connections	Pin 1 = AF input, Pin 2 = earth (– battery), Pin 3 = earth (– battery), Pin 6, 7 (+ battery) must be connected externally (remote switching facility), Pin 8 = screened powering voltage for electret capacitor microphones	

Technical Data:	**SK 1012**	**SK 1012-1**
Range of the sensitivity regulator	46 dB (typical)	46 dB (typical)
Control range of limiting amplifier	30 dB (typical)	30 dB (typical)
Distortion factor throughout modulation range Ntot (1000 Hz)	≦ 1 %	≦ 1 %
Modulation display with mode switch set to "TEST"	LED, red	LED, red
AF requency response	40 Hz to 20 kHz + 1 dB – 3 dB	40 Hz to 20 kHz + 1 dB – 3 dB
Roll-off above 20 kHz	> 18 dB/Oct. (active low pass)	> 18 dB/Oct. (active low pass)
Preemphasis	50 µsec	50 µsec
Power consumption	approx. 15 mA	approx. 40 mA
Power supply	9 V battery IEC 6 F 22	9 V battery IEC 6 F 22
Operating time relative to battery type	approx 8 hours with Braunstein (e. g Daimon No. 333)	(Braunstein not recommended
	approx 5 5 hours, with nickel cadmium cell, e. g Varta Tr 7/8	approx. 1.5 hours
	approx. 32 hours with alkaline manganese cell (e. g Mallory MN 1604)	approx. 6 hours
Battery status check with operating mode switch set to "TEST"	LED, green	LED, green
Dimensions in mm including microphone	150 x 46 x 24	150 x 46 x 24
Weight with battery and microphone	226 g	226 g
FTZ approval No	M-68/80	M-68/80

6 Mikroport-Transmitters
SK 1010 · SK 1010-R · SK 1010-1 · SK 1010-1 R · SK 1010-6 · SK 1010-7 · SK 1010-8 · SK 1010-9



High-quality transmission.
Wide or narrow-band.
Wide range of carrier frequencies.
Models with up to 100 mW RF power.
Range up to approx. 100 m.
High quality limiting amplifiers.
Batteries easy to change.

Despite its small dimensions the SK 1010 Mikroport transmitter offers highest quality. With the screw-on MKE 2010 electret condenser microphone (omnidirectional characteristic) or the MK 4010 electret condenser microphone (cardioid) it can be held comfortably in the hand or worn around the neck. Owing to its small dimensions and flat profile the SK 1010 is also suitable for use as a pocket transmitter. The best microphone to use for such applications is, for example, the MKE 10 clip-on microphone. Other low impedance dynamic microphones are equally suitable for direct connection. The SK 1010 transmitter operates reliably and efficiently even when subjected to rugged treatment. As a power source a conventional 9 V battery or a nickel cadmium storage cell can be employed. The latter can be recharged while fitted by means of two external charging contacts on the transmitter in conjunction with the automatic battery recharger SZL 1010 (see page 110).
The battery status and the limits of the SK 1010 can be checked by means of 2 LEDs with the operating mode switch in centre position. In addition to the high-grade limiting amplifier, an active filter ensures exact shaping of the modulation frequency response. The wide range of models of the SK 1010 ensures compliance with the varying regulations which apply in different countries. The SK 1010 Mikroport Transmitters have been tested and approved both by the Federal German Telecommunications Office and by numerous foreign telecommunications authorities. The frequency range 30 to 45 MHz is available on wide band modulation with the models SK 1010, SK 1010-R, SK 1010-1 and SK 1010-1 R. These models differ in output and have different West German licensing numbers. On the narrow band the SK 1010-6 and SK 1010-7 are available in the same range. The SK 1010-9 covers the frequencies of 140 MHz to 220 MHz. The special version of the SK 1010-8 is used for wireless pilot tone transmission in filming work.

Technical Data:	**SK 1010** (Part No. 1470)	**SK 1010-6** (Part No. 1632)
Carrier frequencies	3 frequencies switchable between 30 and 45 MHz with maximum frequency interval of 1.5 MHz between channel 1 and 3	1 frequency between 30 and 45 MHz
Frequency stability between + 10 ° and + 40 ° C and battery voltage deviation of + 10 % and – 30 %	≦ ± 15 kHz	≦ ± 2.5 kHz
RF output/radiated output	10 mW/approx. 1 mW	10 mW/approx. 1 mW
Radiated spurious and harmonic frequencies	≦ 4 nW	≦ 4 nW
Modulation mode	FM	FM
Rated deviation = peak deviation	± 40 kHz	± 8 kHz
Interference deviation (noise assessed to DIN 45 405)	≦ 100 Hz	≦ 20 Hz
Connection socket	8-pin to DIN 45 326	8-pin to DIN 45 326
AF input voltage for rated deviation	adjustable from approx. 1 mV to approx. 20 mV	adjustable from approx. 1 mV to 20 mV
Control range of limiting amplifier	approx. 36 dB over rated deviation	approx. 36 dB over rated deviation
Interference factor (i_{tot} 1000 Hz) throughout entire modulation range	≦ 1 %	≦ 2 %
AF frequency response	40 Hz to 20 kHz (– 3 dB)	40 Hz to 12 kHz (– 3 dB)
Preemphasis	50 µs	50 µs
Power consumption	approx. 10 mA	approx. 10 mA
Power supply	9 V battery (IEC 6 F 22)	9 V battery (IEC 6 F 22)
Operating time with Varta rechargeable Tr 7/8	approx. 8 hours	approx. 8 hours
Operating time with alkaline manganese cell	approx. 48 hours	approx. 48 hours
Dimensions (with microphone) in mm	150 x 46 x 24	150 x 46 x 24
Weight with battery and microphone	approx. 226 g	approx. 226 g

Rights reserved to adopt modifications, especially in the course of technological progress.

SK 1010 R (Part No. 1599)
As SK 1010, but licensed only for West German broadcasting stations on the frequencies between 32.55 and 38.05 MHz.

SK 1010-1 (Part No. 1586)
As SK 1010, but with 100 mW RF output. Higher current consumption reduces the operating time to about 30 % by comparison with SK 1010. Only available for export.

SK 1010-1R (Part No. 1587)
As SK 1010-1 with 100 mW RF output for broadcasting stations on the broadcasting frequencies.

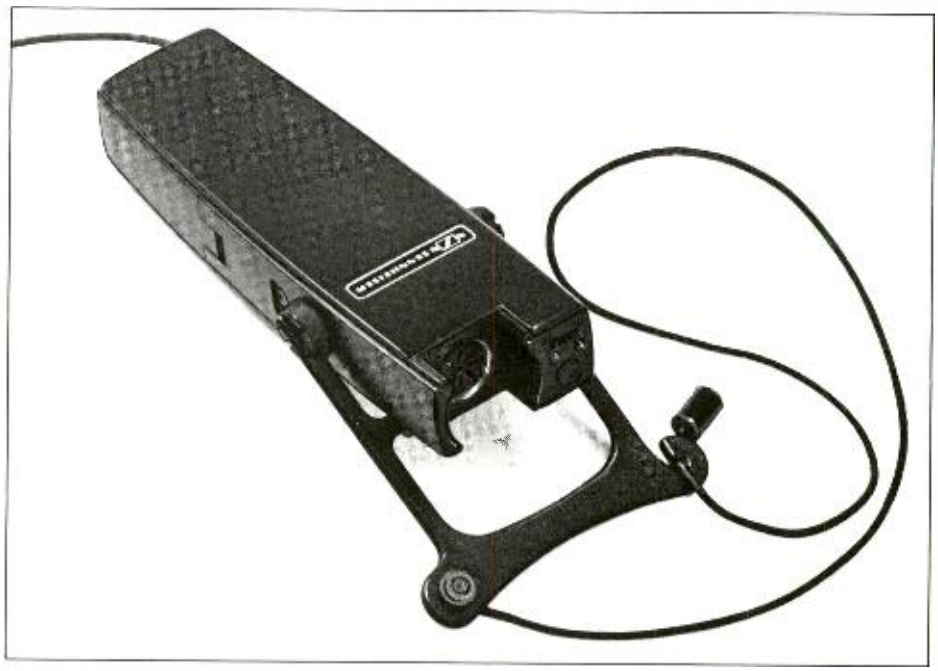
SK 1010-7 (Part No. 1652)
Narrow-band version as SK 1010-6, but with 100 mW RF output. Increased current consumption reduces the operating time to about 30 % by comparison with SK 1010-6.

SK 1010-8 see wireless pilot sound system

SK 1010-9 (Part No. 1710)
Narrow-band version as SK 1010-6, but for frequencies between 140 and 220 MHz and 50 mW RF output. Increased current consumption reduces the operating time to about 30 % by comparison with SK 1010-6.

Mikroport Receivers

EK 1010 · EK 1010-R · EK 1010-6 · EK 1010-8



High transmission quality.
Wide or narrow-band modulation.
Wide range of carrier frequencies.
Quartz oscillators.
2 outputs (2 mV fixed, 2.5 V adjustable).
Electronic squelch, can be switched off.
LED battery check.
LED operating pilot light.
Easy battery change.

The EK 1010 Mikroport receiver is a mini-receiver of the highest quality. It is of identical mechanical construction to the SK 1010 and its small size enables it to be carried unobtrusively, for example in a pocket or around the neck with the accompanying lanyard. All versions are fitted with quartz crystal oscillators and rugged ceramic filters. The high stability of the receiving frequency ensures long-term reliable operation. The power supply is obtained from a conventional 9 V 6 F 22 battery or a nickel cadmium rechargeable cell of the same type. It is not necessary to remove the cell from the receiver for recharging. Recharging contacts on the housing permit automatic recharging with the aid of the SZL 1010 recharger. A red LED lights up to indicate when the receiver is switched on.

The battery status is displayed by a green LED when the operating mode switch is in centre position. Headphones, induction coils or extension leads can be connected to the output of the EK 1010. An output voltage of 2 mV is available as a fixed level at the 8-pin socket, in addition to which the low-impedance output in the same socket can be adjusted by up to approx. 2.5 V. Similarly at the output socket a bridge enables the fixed electronic squelch to be deactivated.
The EK 1010 wideband model has 3 switchable receiving channels from the 30 to 45 MHz range. The widest spacing between these channels should not exceed 1.5 MHz. Our range includes the EK 1010-R, which is the same model but intended for the frequencies used by West German broadcasting stations. For operation in the 40 kHz frequency raster the narrow-band model EK 1010-6 is available and also covers the frequency range between 30 and 45 MHz. Designed in double superhet the unit affords single channel working only. 1 main application is in radio tour guide systems and for assisting the hard of hearing (see page 97). The EK 1010-8 is designed for the special requirements of wireless pilot sound transmission. The EK 1010, EK 1010-R and EK 1010-6 receivers include a headphone as standard, comprising the HZS 1-1, HM 35 and HZL 18-30.

Technical Data:

	EK 1010 (Part No. 1614) **EK 1010-R** (Part No. 1677)	**EK 1010-6** (Part No. 1631)
Receiving frequencies	Max. 3 frequencies switchable between 30 and 45 MHz with max. frequency separation of 1.5 MHz between channels 1 and 3	1 frequency between 30 and 45 MHz
Rated frequency deviation	± 40 kHz	± 8 kHz
Adjacent channel separation at an interference signal ratio of 10 : 1	≧ 60 dB at 400 kHz interval	≧ 60 dB at 40 kHz interval
Sensitivity at rated frequency deviation for 26 dB S/N	≦ 2 µV	≦ 2 µV
RF input	antenna GZA 1010	antenna GZA 1010
AF output (asymmetric)	source impedance approx. 10 Ω rated loading ≧ 100 Ω	source impedance approx. 10 Ω rated loading ≧ 100 Ω
Output connection socket	8-pin socket to DIN 45 326	8-pin socket to DIN 45 326
Output voltages at rated frequency deviation and input voltages ≧ 2 µV	approx. 2.5 V adjustable approx. 2 mV fixed	approx. 2.5 V adjustable approx. 2 mV fixed
Audiofrequency range (– 3 dB)	50 Hz to 15 kHz	50 Hz to 12 kHz
Deviations from rated frequency response (deemphasis 50 µs)	≦ ± 2 dB	≦ ± 2 dB
Distortion factor (1000 Hz FM, rated frequency deviation, 400 µV antenna voltage, output voltage IV)	≦ 2 %	≦ 3 %
Antenna voltage for 50 dB unweighted signal to noise ratio relative to rated frequency deviation	≦ 10 µV	≦ 20 µV
Electronic squelch	fixed at approx. 4 µV	1 to 6 µV internally adjustable, factory setting approx. 4 µV
Power supply	9 V battery (IEC 6 F 22)	9 V battery (IEC 6 F 22)
Quiescient current consumption	approx. 12 mA	approx. 7.5 mA
Current consumption with modulation (RL = 1 kΩ)	approx. 15 mA	approx. 15 mA
Operating time relative to battery type	approx. 6 hours, nickel cadmium to approx. 30 hours alkaline, e. g. Mallory MN 1604)	approx. 6 hours nickel cadmium to approx. 30 hours alkaline e. g. Mallory MN 1604)
Dimensions in mm	145 x 46 x 24	145 x 46 x 24
Weight	approx. 215 g	approx. 215 g

Rights reserved to adopt modifications, especially in the course of technological progress.

For technical data on the **EK 1010-8** see under "Wireless Pilot Sound System".

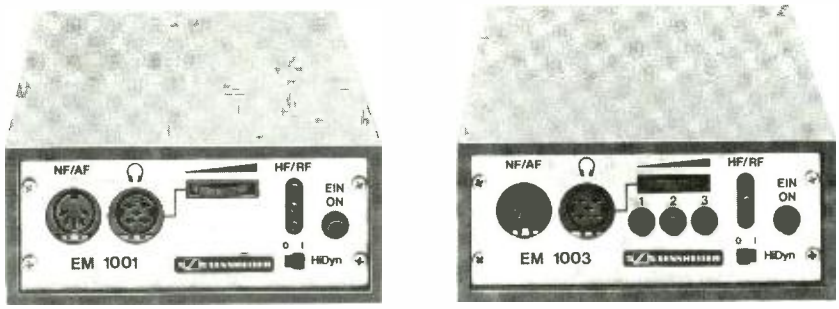
Recommended accessories:

Recharger	**SZL 1010**	(Part No. 1478)
Carrying and holding belt	**EZU 1010**	(Part No. 1616)
Induction coil	**EZI 100**	(Part No. 1634)
Connecting lead for **EZI 100**	**HZL 32**	(Part No. 1635)
Induction loop	**EZI 1010**	(Part No. 1615)

Mikroport Receivers

EM 1001 and EM 1003

Frontal view

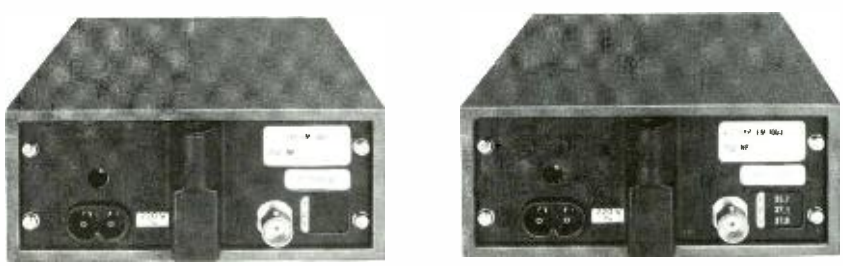


EM 1001 EM 1003

Compact dimensions.
EM 1001: 1 narrow-band receiver channel with "HiDyn" noise suppression system.
EM 1003: 3 wideband receiver channels with "HiDyn" noise suppression system.
LED field strength display.
Facility for outside supply 12 to 24 Volt.
Facility for headphone listening.

The two Mikroport receivers EM 1001 and EM 1003 are small, compact and equipped with the "HiDyn" noise suppression system. The EM 1003 is a 3-channel wideband receiver. In its standard version it is designed for operation on the 3 Mikroport frequencies of 36.7, 37.1 and 37.9 MHz, which are switched by pushbuttons on the front panel. The EM 1001 is a 1-channel narrow-band receiver for a frequency in the range of 30 to 45 MHz. Both receivers are also suitable for mobile use owing to their compact dimensions and the facility for outside voltage supply (12 to 24 Volt dc). The connecting sockets and controls are arranged on the front of the unit. The R. F. field strength is displayed by 3 LEDs of different colour, so that clear information is provided on the level of the incoming signal. The AF signal is available floated symmetrically with a level of 1.55 V (≙ 6 dBm) and the 5-pin output socket (DIN 41 524). A 2 mV level is available on contacts 4 and 5 for connecting low-level inputs. For monitoring the transmission quality direct at the receiver a headphone can be connected with a dice-5 connector and the listening volume is adjustable. A connecting socket is provided on the back of the receiver for the telescopic antenna which is included as standard and a BNC socket for connecting independent antennae. Both receivers are equipped with the "HiDyn" noise suppression system. This professional compander system permits a very significant increase in the useful dynamic range.
To exploit these advantages to the full, it is suggested that a "HiDyn" transmitter should be used suitable for the Mikroport receiver, e.g. SK 1012. To ensure compatibility with other transmitters, for example SK 1010 or SK 1007, the "HiDyn" expander can be switched off.

Back view



EM 1001 EM 1003

EM 1001 · EM 1003

Technical data:	EM 1003	EM 1001
Receiving frequencies	3 frequencies between 30 to 45 MHz, switchable, max. spacing 2 MHz	1 frequency in the range 30 to 45 MHz
Rated deviation	± 40 kHz	± 8 kHz
Adjacent channel selection	≧ 70 dB	≧ 65 dB
Output voltage to AF output connection at rated deviation (antennae voltage > 1.5 µV)	1.55 V ± 2 dB (pins 1 and 3) 2 mV ± 2 dB (pins 4 and 5)	1.55 V ± 2 dB (pins 1 and 3) 2 mV ± 2 dB (pins 4 and 5)
Output voltage to headphone socket at rated deviation (antennae voltage > 1.5 µV)	adjustable between 0 to 1.55 V ± 2 dB	adjustable between 0 to 1.55 V ± 2 dB
AF frequency response	20 Hz to 20 kHz ± 2 dB	20 Hz to 12 kHz ± 2 dB
Distortion factor at rated deviation, 1 kHz and 1 mV antennae voltage	≦ 1 %	≦ 3 %
Deemphasis	50 µsec	50 µsec
Unweighted signal to noise ratio at 40 kHz rated deviation and		
1.5 µV RF voltage	≧ 26 dB	
10 µV RF voltage	≧ 50 dB	
50 µV RF voltage	≧ 60 dB	
Unweighted signal to noise ratio at 40 kHz rated deviation, "HiDyn" operation and		
1.5 µV RF voltage	≧ 60 dB	
3 µV RF voltage	≧ 70 dB	
10 µV RF voltage	≧ 80 dB	
Unweighted signal to noise ratio at 8 kHz rated deviation and		
2 µV RF voltage		≧ 26 dB
30 µV RF voltage		≧ 50 dB
200 µV RF voltage		≧ 60 dB
Unweighted signal to noise ratio at 8 kHz rated deviation, "HiDyn" operation and		
2 µV RF voltage		≧ 46 dB
10 µV RF voltage		≧ 70 dB
30 µV RF voltage		≧ 80 dB
Electronic Squelch	0 to 300 µV internal, adjustable, factory setting 3 µV	0 to 300 µV internal, adjustable, factory setting 10 µV
RF input	50 Ohms, asymmetric, BNC	50 Ohms, asymmetric, BNC
AF output	symmetric, floated, internal impedance approx 20 Ohms rated loading 200 Ohms 5-pin connector to DIN 41 524	symmetric, floated, internal impedance approx. 20 Ohms rated loading 200 Ohms 5-pin connector to DIN 41 524
Headphone output	asymmetric, adjustable rated loading > 10 Ohm dice-5 connector to DIN 45 327	asymmetric, adjustable rated loading > 10 Ohm dice-5 connector to DIN 45 327
Current supply	110/220 V, 50 to 60 Hz (resolderable) or 12 to 24 V external supply	110/220 V, 50 to 60 Hz (resolderable) or 12 to 24 V external supply
Current consumption	approx. 110 mA	approx. 110 mA
Dimensions in mm	170 x 120 x 53	170 x 120 x 53
Weight	1120 g	1120 g

Mikroport Receiver

EM 1012

**High quality Mikroport receiver.
With "HiDyn" switchable squelch.
Compatible with SK 1010 and SK 1012.
Battery operation or 12 V external powering possible.**

The EM 1012 Mikroport receiver is a mains operated receiver which can be operated on up to 5 quartz-stabilised reception channels. This unit is a further development of the EM 1010 receiver. Equipped with the "HiDyn" noise suppression system and an improved IF amplifier, the EM 1012 offers a high standard of transmission quality and reliability. It has already been prepared for the possibility of diversity operation with the EZD 1010 slave unit. The EM 1012 can be operated either with the SK 1012 transmitter or with the SK 1010 transmitter. When operated with the "HiDyn" SK 1012 transmitter, signal to noise ratios are achieved which are about 12 to 35 dB higher than with the EM 1010. In its standard version the EM 1012 is suitable for operating in the 3 Mikroport frequencies of 36.7, 37.1 and 37.9 MHz. The following variations are also available:

EM 1012-2 5-channel wideband 30 to 45 MHz
EM 1012-4 5-channel narrow-band 140 to 190 MHz
EM 1012-5 5-channel wideband 140 to 190 MHz
EM 1012-7 5-channel narrow-band 30 to 45 MHz

As with the EM 1010 a meter select switch is provided on the front of the unit. Either the received field strength or the deviation of the transmitter can be indicated.

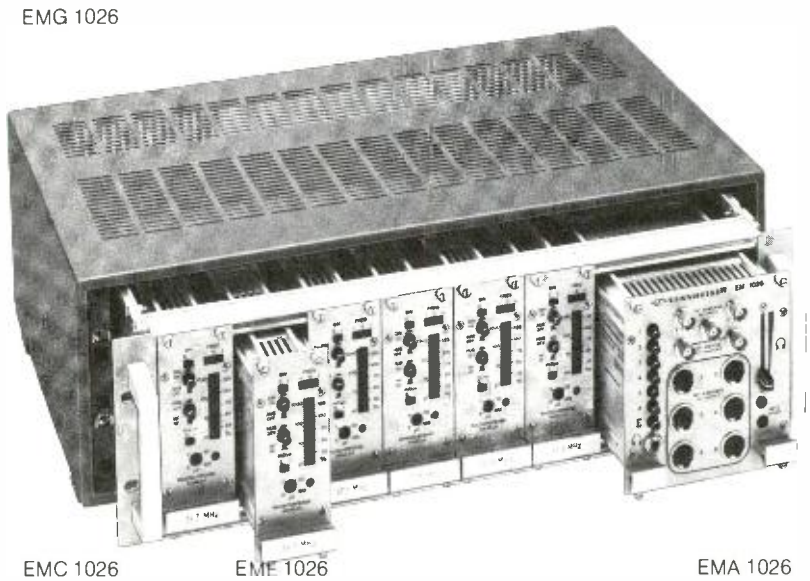
A further button permits the operating voltage to be displayed. The EM 1012 can also be powered by batteries or through an external connection from a 12 V source. It offers additionally a connection socket for headphones, whereby the monitoring loudspeaker is switched off automatically. A comprehensive range of accessories is available as for all other Sennheiser receivers. These include the telescopic antenna TA 203, the antenna coupler EZW 1010 for multi-channel systems with selected frequencies, the diversity slave unit EZD 1010 and the high performance antenna GZA 1000.

Technical Data:	**Wideband**	**Narrow-band**
Receiving frequencies	36.7, 37.1 and 37.9 MHz (EM 1012)	5 frequencies in the 140 to 190 MHz range, max. interval between channels 1 and 5 = 3 MHz (EM 1012-4) 5 frequencies in the 30 to 45 MHz range, max. interval between channels 1 and 5 = 3 MHz (EM 1012-7)
Receiving frequencies in special version	5 frequencies in the 30 to 45 MHz range, max. interval between channels 1 and 5 = 3 MHz (EM 1012-2) 5 frequencies in the 140 to 210 MHz range, max. interval between channels 1 and 5 = 3 MHz (EM 1012-5)	
Rated deviation	± 40 kHz	± 8 kHz
Adjacent channel rejection	≧ 70 dB (≦ f = 400 kHz)	≧ 60 dB (≙ f = 40 kHz)
Output voltage at rated deviation and with more than 1 µV antennae voltage	1.55 V ± 2 dB	1.55 V ± 2 dB
Audiofrequency range	20 Hz to 20 kHz	20 Hz to 12 kHz
Deviation from quoted frequency response (deemphasis 50 µsec	max. ± 2 dB	max. ± 2 dB
Non-linear distortion at rated deviation and 1 kHz modulation frequency	≦ 1 %	≦ 3 %
Weighted signal to noise ratio at 40 kHz deviation and 1 5 µV antennae voltage (without HiDyn)	≧ 26 dB	
(with HiDyn)	≧ 60 dB	
Weighted signal to noise ratio at 8 kHz deviation and 3 µV antennae voltage (without HiDyn)		≧ 26 dB
(with HiDyn)		≧ 55 dB
Weighted signal to noise ratio at 40 kHz deviation and more than 10 µV antennae voltage (without HiDyn)	≧ 50 dB	
(with HiDyn)	≧ 80 dB	
Weighted signal to noise ratio at 8 kHz and more than 30 µV antennae voltage (without HiDyn)		≧ 50 dB
(with HiDyn)		≧ 70 dB

Technical Data:	**Wideband**	**Narrow-band**
Signal to noise ratio CCIR 468 (peak) at 40 kHz deviation and more than 50 µV antennae voltage (without HiDyn)	≧ 60 dB	
(with HiDyn)	≧ 75 dB	
Signal to noise ratio CCIR 468 (peak) at 40 kHz deviation and more than 50 µV antennae voltage (without HiDyn)		≧ 55 dB
(with HiDyn)		≧ 70 dB (typical 74 dB)
Electronic squelch, switchable, aerial voltage adjustable	2 to 20 µV 3 µV factory setting	
Input 1	asymmetric for 60 Ohm source impedance, 13 mm RF connector to DIN 47 283	
Input 2	symmetrical for 240 Ohm sources to DIN 45 317	
Output	floating output impedance approx. 20 Ohms Rated loading 200 Ohms, 5-pin standard connector socket to DIN 41 524	
Diversity operation	2 or more receivers at the connector sockets, interlinked for diversity, 5-pin standard connector to DIN 41 524 Combining circuit operation with diversity EZD 1010 possible	
Tape recorder remote control	Tape stop connector socket to be linked with the remote control connection of the tape recorder 5-pin standard connector socket to DIN 41 524	
Headphone connection	Dice-5 connector to DIN 45 327, internal impedance 15 Ohms, inserting plug switches built-in loudspeaker off. Output connector socket adjustable	
Poer supply	optionally from the built-in mains unit 110/220 V, 50 to 60 Hz, from 2 x 9 V power source, e. g. Pertrix No. 439, Daimon No. 229 (operating time in battery operation approx. 20 hours) or from a 12 V motor vehicly battery	
Power consumption in mains operation	approx 4 W	
Fuses	0.2 A semi time lag	
Dimensions in mm	294.5 x 172.5 x 102	
Dimensions in mm with handles and feet	294.5 x 195.5 x 102	
Weight	approx. 3.3 kg	

Multi-Channel *Mikroport* Receivers

EM 1026 · EMA 1026 · EMB 1026 · EMC 1026 · EME 1026 · EMG 1026



For maximum professional quality requirements.
Superlative intermodulation.
High selectivity.
Quartz-crystal oscillators.
Maximum of six receiver modules per frame.
Built-in diversity operation.
Built-in antenna splitters.
Audio monitor.
19" modular rack design.
Comprehensive LED displays.
"HiDyn" noise suppression system.

The multi-channel EM 1026 receiver is designed for the special requirements of simultaneous reception of numerous Mikroport channels. Special attention has been paid to avoiding the disruption caused by intermodulation between the individual channels. In addition it fulfills the needs of the professional user in respect of operating convenience and flexibility.
The mechanical layout is designed for the 19" rack system. The unit can accomodate a maximum of 6 EME 1026 receiver modules and 1 EMA 1026 connection unit within 1 EMC 1026 chassis. A rugged sheet steel outer cabinet EMG 1026 is available to accommodate the chassis. The receiver is available for frequencies in the 30 to 45 MHz range. In addition to the standard EM 1026 thus assembled, the EM 1026-R is also available for use in conjunction with German broadcasts, this unit incorporating solely the channels available to West German broadcasting stations between 32.55 and 38.05 MHz. The chassis EMC 1026 incorporates the mains unit and the entire wiring leading back to the plug couplings to the individual receiver modules. The EMA 1026 connection unit slides into the right-hand side of the chassis. This incorporates the central mains switch for the complete unit and the RF inputs, AF outputs and a facility for monitoring individual AF signals separately and together with adjustable volume. The RF signal is distributed from the connection module via built-in antenna splitters to the EME 1026 receiver modules.
The receiver modules are single-channel to ensure best possible selectivity. The front panels on the modules incorporate an operating mode switch for switching off the individual channel. The incoming RF voltage and the transmitter deviation can be displayed optionally by means of a push-button switch. Excessive deviation between transmitter and receiver frequency is displayed by LED.
A particular feature is the diversity facility provided in the receiver modules: activating a slide switch will interspace two adjacent receiver modules so that the receiver with insufficient input signals will cut itself off before any interference becomes audible in the output. This extends from background noise up to the range of maximum input voltages of several millivolts. The potentiometer for the squelch switching threshold is also accessible from the front of the unit. a green LED adjacent to this potentiometer indicates "squelch off" status.
If the receiver does not incorporate six channels any vacant spaces can be blanked off by blanking plates EMB 1026.
By means of the built-in RF antenna splitters and additional external accessories it is possible to couple several EM 1026 units to form large scale systems (antenna splitter EZW 1016 and high performance antenna GZA 1000). The GZL 1026 BNC connecting leads are included as standard. This permits, for example, the signal from one antenna to be distributed over all six modules within one chassis. In "HiDyn" operating mode is is possible to achieve an extraordinarily high reduction in interference noise, which is reduced by the expander. A "HiDyn" transmitter, for example the SK 1012, is required for linear dynamic transmission.

6 Multi-Channel *Mikroport* Receivers

EM 1026 · EMA 1026 · EMB 1026 · EMC 1026 · EME 1026 · EMG 1026

Technical Data:

EME 1026 (Part No 1775)

Receiving frequencies	1 frequency between 30 and 45 MHz
Input	asymmetric for 50 Ω source impedance
Output	floating symmetrical, output impedance to 29 Ω, rated loading 200 Ω
Rated deviation	± 40 kHz
Output voltage at rated deviation and above 1 5 V RF voltage	1.55 V ± 2 dB (adjustable internally from 550 mV to 3 1 V ± 2 dB
Audiofrequency range (– 2 dB)	20 Hz to 20 kHz
Deviation from desired frequency response (deemphasis 50 µs)	max ± 2 dB
Distortion factor at rated deviation (modulation frequency 1 kHz, RF voltage 1 mV)	≦ 1 %
Start of limiter operation (– 3 dB)	≦ 1 µV
Unweighted S/N ration at rated deviation and 1.5 µV RF voltage	≧ 26 dB
Unweighted S/N ratio at rated deviation and 10 µV RF voltage	≧ 50 dB
Unweighted S/N ratio at rated deviation and 50 µV RF voltage	≧ 60 dB
Maximum unweighted S/N ratio at rated deviation	≧ 70 dB
Unweighted S/N ratio in HiDyn mode, at rated deviation and 1 5 µV RF voltage	≧ 60 dB
Unweighted S/N ratio in HiDyn mode, at rated deviation and 3 µV RF voltage	≧ 70 dB
Unweighted S/N ratio in HiDyn mode, at rated deviation and 10 µV RF voltage	≧ 80 dB
Adjacent channel selectivity with 400 kHz offset of a second transmitter (2-transmitter system)	≧ 80 dB
Intermodulation relative to S/N = 26 dB (2-transmitter system), carrier spacing 400 and 800 kHz	≧ 85 dB
IF-selection	≧ 90 dB
Image frequency rejection	≧ 80 dB
Electronic squelch adjustment	0 to 100 µV at EMA input
Combing-circuit (only with diversity mode)	6 µV fixed at EMA input

Rights reserved to adopt modifications, especially in the course of technological progress

Technical Data:

EMA 1026 (Part No 1772)

Antenna splitter, 1 input, 3 outputs (2 outputs (2 built-in with wired outputs)	
Frequency range	1 to 100 MHz
Insertion loss	≦ 0 85 dB
Distribution loss	4 8 dB
Decoupling of outputs	≧ 25 dB
Antenna splitter, 1 input, 2 outputs (1 built-in, input and outputs accessible)	
Frequency range	1 to 100 MHz
Insertion loss	≦ 0 5 dB
Distribution loss	3 dB
Decoupling of outputs	≧ 20 dB
Audio outputs, 6 output sockets to DIN 41 524 for receiver locations 1 to 6, output floating, symmetrical	
Output voltage with receiver at rated deviation	1.55 V ± 2 dB
Source impedance	approx. 20 Ω
Rated loading	≧ 200 Ω
Headphone monitor output	6 35 mm jack connector
Output voltage adjustable	0 to 1 55 V
Source impedance	< 20 Ω
Rated loading	> 100 Ω

Rights reserved to adopt modifications especially in the course of technological progress

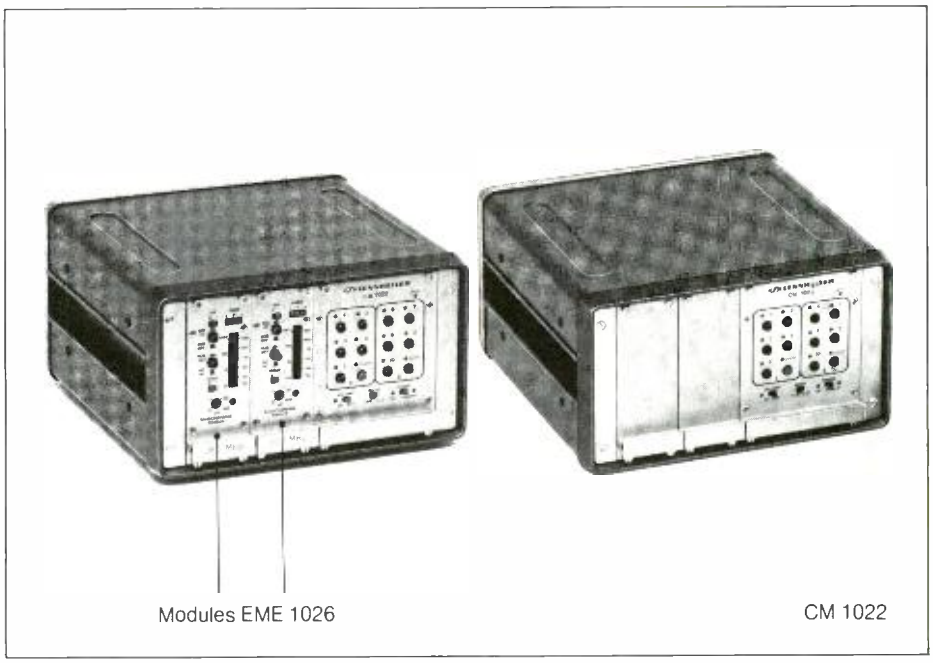
Technical Data:

EM 1026 (Part No 1771)

Power supply	50 to 60 Hz, 190 to 240 V ino 220 V operaton 95 to 120 V in 110 V operation
Mains fuses	0.63 AT
Power consumption fully equipped	approx 55 VA
Dimensions in mm	540 x 330 x 165
Weight	16 kg

Rights reserved to adopt modifications, especially in the course of technological progress

Mikroport Control



Modules EME 1026

CM 1022

Remote controlled alternating operation of up to 10 Mikroport transmitters on the same frequency or in two groups on two frequencies each on five transmitters.
Only one receiver required for up to 10 Mikroport transmitters.

With Mikroport control it is possible to extend the range of applications for the wireless type microphone (Mikroport). It is thus possible to switch on or off alternately up to 10 microphones – each operating on the same frequency – for example in case of discussions. For reception purposes only one Mikroport receiver is required. This means that, for example in the case of discussions, up to 10 microphones can be distributed throughout the room for which "permission to speak" is given by remote control. It is also possible to form 2 groups each of 5 microphones. Commands for switching on or off microphones are passed by an ultrasonic signal which is generated by the control unit, radiated via ultrasonic loudspeakers and received and analysed by the microphones on the Mikroport transmitter.

The CM 1022 control transmitter forms the nucleus of the system. It generates all control signals necessary for switching over the Mikroport transmitter. The designation CM 1022 denotes 3 modules, the control module CMS 1022, the chassis CMC 1022 and the housing CMG 1022 together. The housing CMG 1022 provides space for a total of 4 modules. In standard equipment the 2 first spaces are occupied by the CMS 1022 control module. The 2 free spaces can either be occupied by additional amplifier modules CMV 1022, each of which supplies 2 additional ultrasonic loudspeakers CML 1022 for very large rooms or with 2 Mikroport receiver modules EME 1026. Unused cassette space are covered by blanking plates EMB 1026.
The operating control sector on the control module carries 10 buttons for selecting the individual Mikroport transmitter and 2 "clear" keys for special requirements. 2 operating modes are possible with the control transmitter:

1. Operation of two groups each of 5 Mikroport transmitters (= 2 receiving frequencies).
2. Coupling of both groups of 5 to form one group of 10 transmitters (= 1 receiver frequency).

The portable Mikroport transmitters (ideally SK 1012) are fitted only with the CMM 1022 remote controlled microphone for use with the Mikroport control system. In addition to the microphone capsule this unit incorporates a complete ultrasonic receiver and a logic circuit for analysing the ultrasonic signals emitted by the Mikroport control transmitter. These ultrasonic signals originate from the aforementioned loudspeaker CML 1022, which is linked with the control transmitter CM 1022 and suitable for either wall or stand mounting. The loudspeaker is provided with a quick change threaded insert for mounting on stands with a $^{3}/_{8}$", $^{1}/_{2}$" or $^{5}/_{8}$" x 27 G thread.

Technical data CML 1022

Impedance	4 Ohms
Rated loading	16 W
Dimensions in mm	90 x 50 x 120
Weight	approx. 740 g

SK 1012

CMM 1022

CML 1022

Pilot Tone System

SK 1010-8 · EK 1010-8 · GZP 101

GZP 101

For 50 Hz pilot tones in film and TV production.
For greater mobility.
Tape recorder remote start with GZP 101.
Clap utilisation with GZP 101.
For operation with Eclair and Arriflex cameras.

For many years the pilot tone system has been used as a synchronising aid in film and TV work. The wireless Sennheiser pilot tone system cancels out the need for wiring connections between the tape recorder and camera. It consists basically of the narrow-band transmitter SK 1010-8 and the pilot tone receiver EK 1010-8. Both units are quartz-crystal stabilised and obtainable in the range between 30 and 45 MHz. The West German broadcasting organisations use the officially approved version for the channels available to them. The transmission or receiving antennae can be fastened to the camera or tape recorder carrier strap. The SK 1010-8 is connected to the camera by a short lead. The transmitter, powered by its own battery, is switched on simultaneously with the camera. As soon as the camera emits the pilot tone a red LED lights up on the transmitter. The operating time of the transmitter depends on the type of battery used. We recommend alkaline cells which allows an operating period of approx. 10 hours.
The EK 1010-8 pilot tone receiver receives the signal radiated from the transmitter to the camera and supplies the 50 Hz camera pilot tone to the pilot tone track of the tape recorder. Owing to the low power consumption an alkaline cell will operate the receiver for approx. 30 hours. Here it is also possible to use inexpensive transistor radio batteries but these deliver only approx. one quarter of the aforesaid operating time. Under difficult conditions it may be helpful to extend the antenna upwards beyond the carrying strap. Telescopic antennae are also available as optional accessories for transmitter and receiver, these being screwed into the units in place of the wire antennae.
The GZP 101 pilot tone slave unit enhances the scope for wireless synchronisation. The tape recorder, equipped appropriately, is started simultaneously as the camera is switched on. After the camera has run up to operating speed the pilot tone is delivered to the tape recorder input (as with operation without slave unit). If tape recorders with built-in pilot tone oscillators are used the slave units can be used to start the oscillator. The clapper impulse transmitted by the camera starts the built-in oscillator in appropriately equipped tape recorders. The slave unit can also be used for wired operation. In addition to the automatic function the tape recorder and pilot tone oscillator can be started manually by means of two switches.
Details on connecting leads for the most frequently used cameras and tape recorders are available on request.

EK 1010-8

SK 1010-8

Technical Data:

	SK 1010-8 (Part No 1696)
Carrier frequency	1 frequency between 30 and 45 MHz
Frequency stability between + 10° C and 40° C and deviation in battery voltage by + 10 % and – 30 %	better than ± 2.5 kHz
RF output/radiated power	100 mW/approx. 10 mW
Radiated spirius emmissions	≦ 4 nW
Modulation	FM
Rated frequency deviation	± 8 kHz
Peak deviation	± 15 kHz
Interference deviation (weighted to DIN 45 405)	≦ 20 Hz
AF input voltage for rated frequency deviation	1 V
Distortion factor at ± 7 kHz deviation	≦ 2 %
Audiofrequency response	40 Hz to 12 kHz
Current consumption	approx. 35 mA
Current supply	9 V battery (IEC 6 F 22)
Operating time relative to battery type	approx. 2.5 hours (nickel cadmium cell. e. g. Varta Tr 7/8) approx. 10 hours (alkaline cell, e. g. Mallory MN 1604)
Dimensions in mm	145 x 46 x 24
Weight	approx. 215 g
	EK 1010-8 (Part No 1697)
Receiving frequency	1 frequency between 30 and 45 MHz
Rated frequency deviation	± 8 kHz
Adjacent channel selectivity at an interference/useful ratio 10 : 1	≧ 60 dB in 40 kHz spacing
Sensitivity at rated frequency deviation for 26 dB S/N	≦ 1 µV
RF input	antenna GZA 1010
AF output	source impedance approx 10 Ohms. loading = 100 Ohms
Output voltage at rated frequency deviation and input voltage > 2 µV	1 V
Audiofrequency range (– 3 dB)	170 Hz
Current consumption (R_L = 1 kΩ)	approx. 15 mA
Current consumption	9 V battery (IEC 6 F 22)
Operating time relative to battery type	approx 6 hours (nickel cadmium cell, e. g. Varta Tr 7/8) approx. 30 hours (alkaline cell, e. g. Mallory MN 1604)
Dimensions in mm	145 x 46 x 24
Weight	approx. 215 g

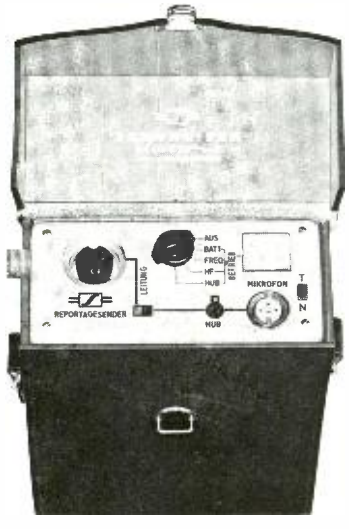
6 Auxiliary Broadcast Station Transmitters

SER 1 · SER 1-3 · SER 1-4 · SER 1-B 5 · SZV 10 · GZB 1-2 · GZB 4-2 · GZN 10

SER 1-4

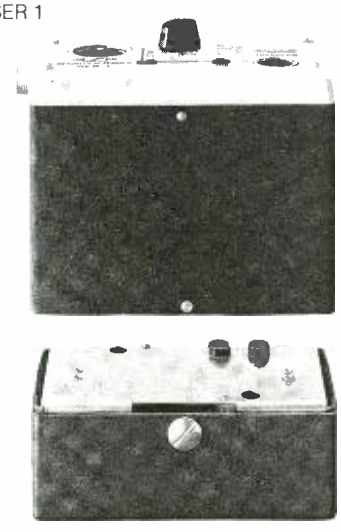
For optimum transmission quality.
Rugged and reliable.
Portable.
10 W and 1 W options.
For long-range operation.
Battery or ac operation.
Separate mains unit for continuous operation.
For connecting with dynamic and condenser microphones.
Line input + 6 dB.
Wide range of possible carrier frequencies.
Wide or narrow-band modulation.

The SER Transmitters for high quality audio transmission have proved very successful both in Germany and abroad, especially for broadcast reporting and news gathering.
Two power ranges are available to accommodate the different distance ranges to be covered.
The SER 1-3 model is designed for an RF output power of 1 W. It consists of the transmitter head and the rechargeable battery SER 1-B 5. The same transmitter head is used also with the SER 1-4. It has two inputs: all low-impedance dynamic microphones and 12 V AB-powered condenser microphones can be connected to the microphone input. The condenser microphones are powered directly from the transmitter. The line level input (+ 6 dB) can be switched alternatively by a slider switch to the modulator. In addition to turning on the system, the operating mode switch also controls display of the battery level, the RF level and deviation on the built-in moving coil instrument. The unit is available with peak deviations of 15 kHz or 75 kHz and can thus be used for frequency allocation rasters in the 40 kHz or 300 kHz range. The required deviation must be specified when ordering. It is possible to attach to the output socket either the antenna which is incorporated in the carrying strap of the carrier case supplied as standard, the accompanying steel band antenna or a remote antenna connected by lead.
The power supply for the transmitter is obtained from the battery pack SER 1-B 5. This offers a capacity of 1 Ah at a voltage of 15 V and permits continuous operation for approx. 4 hours. The SER 1-B 5 cell can be recharged with the SZL 15 charger unit, which switches off automatically when charging is completed. The recharge time is approx. 14 hours. The GZB 1-2 rechargeable battery is used in conjunction with the SZL 25 fast recharger. The SER 1-4 is available for increased transmission output of 10 W. This output is achieved by coupling the transmission head described above with the SZV 10 output stage. For technical reasons the leather carrying case is not available with SER 1-4. In addition to the amplifier, this output stage also incorporates the necessary filters for suppression of spurious radiation. Owing to the increased current consumption a more powerful GZB 4-2 battery pack is available for the boosted version.
The GZB 4-2 battery pack offers a rated capacity of 4 Ah at a voltage of 15 V, giving the SER 1-4 an operating period of more than 2 hours. The GZB 4-2 incorporates special sinter cells suitable for fast recharge, for which a special connection is incorporated adapted to connect with the SZL 25 recharger. The charge is then completed within one hour so that continuous operation is also possible with only 2 battery sets in alternating use.
Sennheiser offers the GZN 10 mains unit as a further accessory to permit operation either from the 220 V lighted mains or from a 24 V motor vehicle battery. Further data will be found on page 107.



SER 1-3

SER 1



SER 1-B 5

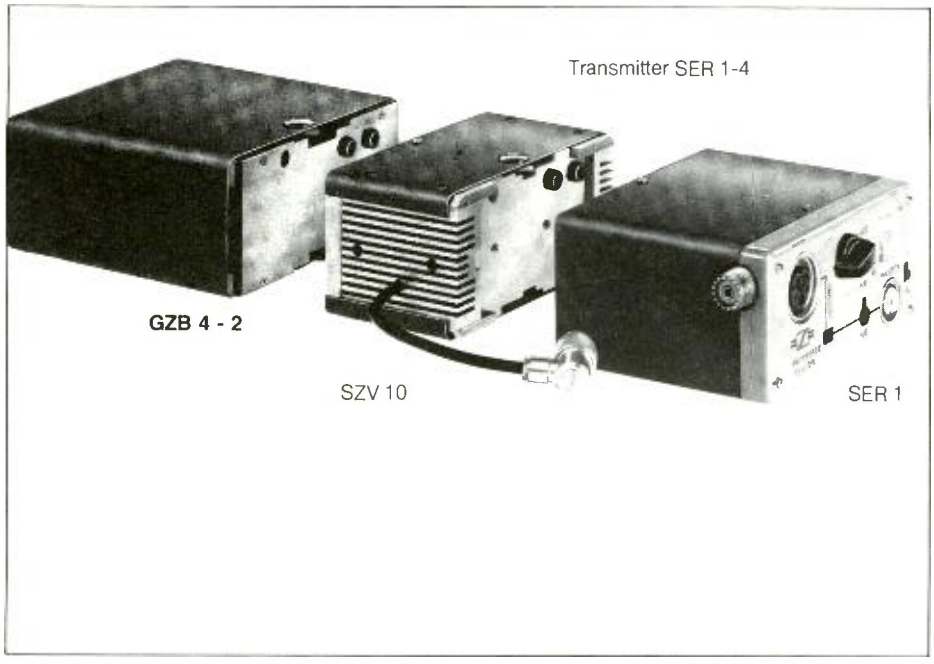
GZB 1-2

GZB 4-2

6 Auxiliary Broadcast Station Transmitters

SER 1 · SER 1-3 · SER 1-4 · SER 1-B 5 · SZV 10 · GZB 1-2 · GZB 4-2 · GZN 10


GZN 10



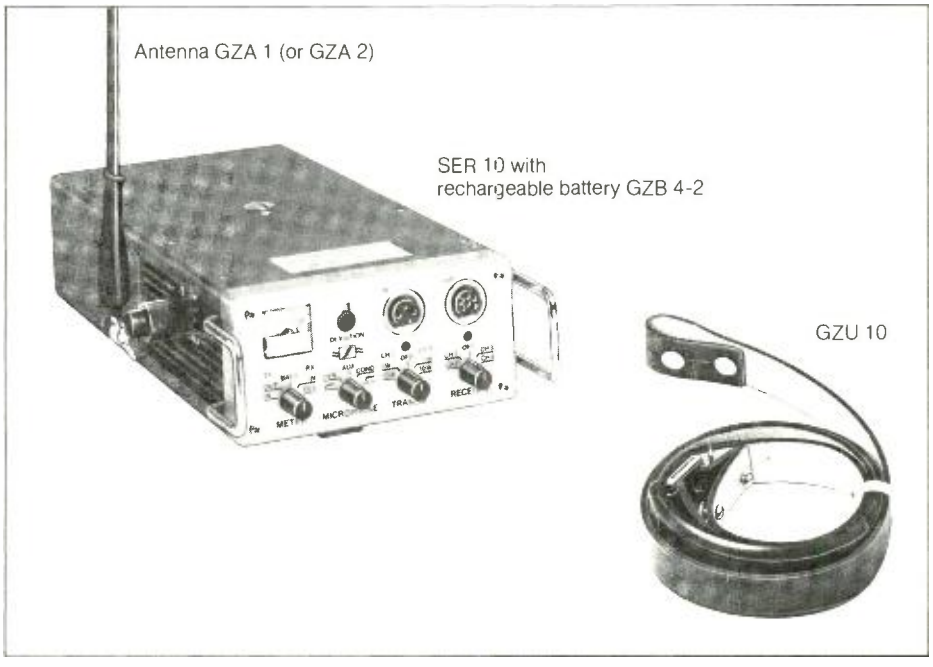
Technical Data

	SER 1-3/SER 1-4
RF section	
Transmitting frequencies	2 frequencies in the 25 to 110 MHz range, max. 0.5 MHz separation
RF output power	SER 1-3: 1 W, SER 1-4: 10 W
Output connection	50 Ω coaxial (UHF connector socket)
Modulation	FM max. ± 15 kHz (50 F 3), max. ± 75 kHz (150 F 3)
Frequency stability (± 10 % U_{Batt} and temperature – 10° to + 40° C)	5×10^{-5} (at 50 F 3) 10×10^{-5} (at 150 F 3)
AF section	
Microphone input	switchable for dynamic N microphones and 12 V capacitor microphones
AF input voltage for ± 8 kHz (± 40 kHz) rated deviation	0.6 to 15 mV, adjustable
S/N ratio (relative to nominal deviation weighted to DIN 45 405 and with 50 µ deemphasis)	> 53 dB
AF frequency response	40 Hz to 16 kHz (+ 1 to – 2 dB)
Line input	suitable for 200 Ω sources
Input resistance	≧ 3 kΩ
AF input voltage for ± 8 kHz (± 4 kHz)	1.55 V
Signal to Noise ratio (relative to rated deviation)	> 62 dB
Audiofrequency response	45 Hz to 20 kHz (+ 1 to – 2 dB)
Distortion factor at rated deviation	> 1 %
Limiting amplifier	acting on both inputs
Start of limiter operation	± 8 kHz deviation (± 40 kHz deviation)
Limiter characteristic	above 8 kHz deviation (40 kHz deviation) Over-modulations up to 36 dB are corrected to 1 dB. The distortion factor remains below 2 %
Preemphasis	50 µs
Operating voltage	15 V
Function range	12 to 17 V
Current consumption at U_{Batt} = 15 V	SER 1-3 at 1 W approx. 250 mA SER 1-4 at 10 W approx. 1.3 A
Rechargeable batteries	15 V 1 Ah (SER 1-B 5) GZB 1-2 (for SER 1-3) 15 V 4 Ah (GZB 4-2) for SER 1-4
Operating time	SER 1-3 with SER 1-B 5 3-4 hours SER 1-3 with GZB 1-2 3-4 hours SER 1-3 with GZB 4-2 14-16 hours SER 1-4 with GZB 4-2 2-3 hours
Built-in gauges for	operating voltage, RF output voltage and frequency deviation
Scope of delivery	
SER 1-3	transmitter with SER 1-B 5 rechargeable battery, leather carrying case with provisional antenna in carrying strap λ/4 steel band antenna or 120 cm steel band antenna with extension coil
SER 1-4	transmitter with GZB 4-2 rechargeable battery and λ/4 steel band antenna or 120 cm steel band antenna with extension coil
Dimensions with battery box in mm	
SER 1-3	170 x 135 x 65
SER 1-4	340 x 135 x 65
Weights	
SER 1-3 (control transmitter with 1 W output stage)	1.1 kg
SZV 10 (10 W output stage)	0.8 kg
SER 1-B 5 (1 Ah rechargeable battery)	1.0 kg
GZB 1-2	approx. 1 kg
GZV 4-2 (4 Ah rechargeable battery)	2.5 kg

Rights reserved to adopt modifications, especially in the course of technological progress

Auxiliary Broadcast Station Transmitter

SER 10



For optimum transmission quality.
Output power switchable 1 W/10 W.
Built-in cue receiver.
Frequency response 30 MHz to 200 MHz.
Wide or narrow-band version.
Compact, rugged construction.
Rechargeable battery operation.
AC power supply unit.

The SER 10 transmitter continues the extremely successful range of equipment for auxiliary broadcasting. Noteworthy characteristics of this extremely compact mobile transmitter unit are the switch-selectable RF output power of 1 W or 10 W and a built-in cue receiver. This cue receiver permits, for example, relaying of instructions to the reporter. A common antenna is used for both transmitter and receiver.
The control panel incorporates a moving coil instrument for monitoring the various functions of the unit. The rotary selector swich can be set to obtain readings on transmitter deviation, output voltage, battery level, input voltage of the receiver and frequency deviations of the incoming signal.
The input socket is for connection of dynamic microphones, 12 V AB powered condenser microphones or for connecting up a programme line. A rotary switch controls selection and level matching. In addition a level matching filter can be brought into play for the microphone settings. Frequency deviation takes effect only when the microphone is being used. In line operation the input is symmetrical and designed for a level of + 6 dB.
A third rotary switch is provided for selection of frequency and output in the transmitter sections. The receiver section also has its own rotary switch for selecting one of 4 receiving channels. LEDs display the operation of transmitter and receiver. The receiver output voltage is available at a fixed level at a socket on the front panel.
The standard model operates on transmitting frequencies of 77.53 and 77.59 MHz at a maximum deviation of 15 kHz. The cue return path is in the 20 kHz channel spacing raster pattern for the usual frequencies around 160 MHz. The modules can be varied both on the transmitter and on the receiver sides. The transmitter side is able to cover a total range of 30 to 200 MHz and the same applies to the receiver side. The unit can be set up both for wide and narrow-band operation. Owing to simultaneous operation of transmitter and receiver using a common antenna it is generally necessary for the transmission and receiving frequencies to be separated by a factor of about 2.
Power supply for the unit comes from the GZB 4-2 rechargeable battery which is rapidly recharged with the SZL 25 charger unit. The GZN 10 mains unit can also be used for this transmitter. The SER 10 is supplied with a wide leather carrier belt for portable use. See page 108 for technical data.

GZN 10
Mains unit for SER 10 (also SER 1-3, SER 1-4, ER 2 and ER 3) is used in place of the rechargeable battery on the transmitter and permits operation from the 220 V lighting mains system and from 24 V motor vehicle batteries. When operating the GZN 10 with SER 1-3, SER 1-4, ER 2 and ER 3 from a 24 V motor vehicle battery care must be taken to ensure that the positive terminal is connected to the housing.

Current supply:	220 V/110 V or 24 V motor vehicle battery
Output:	15 V/max. 2 A
Dimension in mm:	277 x 135 x 87
Weight:	3 kg
Colour:	black

SZL 25, see page 110


GZN 10


SZL 25

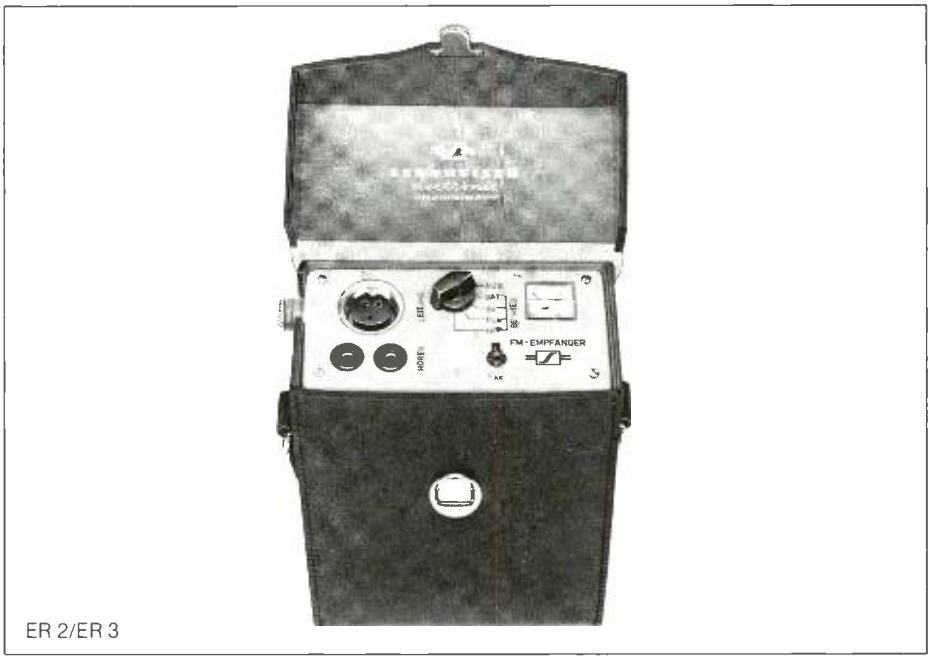
Auxiliary Broadcast Station Transmitter

SER 10

Technical Data:	**SER 10-0** (Part No. 1724)	**SER-10-Variations** (Part No. according to model)	
RF transmitter section			
Transmission frequencies	77.53 and 77.59 MHz or 2 frequencies between 87.5 and 104 MHz (SER 10-17)	30 to 200 MHz max. 2 channels, frequency spacing max. 1.5 %	
RF output into 50 Ω dummy load	10 W and 1 W, switchable	5 to 10 W and 1 W switchable	
Modulation, FM	50 F 3 (SER 10-17 : 150 F 3)	50 F 3	150 F 3
Rated deviation/peak deviation	± 8 kHz/± 12 kHz (SER 10-17 : ± 40 kHz/± 75 kHz)	± 8 kHz/± 12 kHz	± 40 kHz/± 75 kHz
Frequency stability at ± 10 % U_{Batt} and temperature – 10 ° to + 55 ° C	± 5 · 10^{-5}	± 5 · 10^{-5}	± 10 kHz
Suppression of harmonics	≧ 65 dB	≧ 58 dB	≧ 58 dB
AF transmitter section			
Input	switchable for dynamic low impedance microphones 12 V T condenser microphones and line	switchable for dynamic low impedance microphones 12 V T condenser microphones and line	
Input voltage for rated deviation			
Dynamic microphones	0.6 to 20 mV adjustable	0.6 to 20 mV adjustable (max. 600 mV)	
T-capacitor microphones	0.8 to 28 mV adjustable	0.8 to 28 mV adjustable	
Line (auxiliary)	1.55 V	1.55 V	
AF frequency response (– 3 dB)			
Microphone	20 Hz to 15 kHz	20 Hz to 15 kHz	20 Hz to 20 kHz
Microphone with roll-off filter	200 Hz to 15 kHz	200 Hz to 15 kHz	200 Hz to 20 kHz
Line (auxiliary)	30 Hz to 15 kHz	30 Hz to 15 kHz	30 Hz to 20 kHz/70 kHz
Distortion factor at rated deviation	< 1 %	< 1 %	< 1 %
Modulation range of limiting amplifier (distortion 1 %)	≧ 36 dB	≧ 36 dB	≧ 36 dB
Signal to noise ratio (DIN 45 405)			
Microphone input, deviation set to 9	≧ 52 dB	≧ 52 dB	≧ 52 dB
Microphone input, deviation set to 1	≧ 60 dB	≧ 60 dB	≧ 58 dB
Line input	≧ 60 dB	≧ 60 dB	≧ 58 dB
Preemphasis	50 µs	50 µs or without	
Current consumption, transmitter	approx. 1.5/0.6 A	approx. 1 to 1.5/0.6 A	
RF Receiver section			
Reception frequencies (max. 4 channels)	160.00 to 160.18 MHz and 164.50 to 164.78 MHz	30 to 160 MHz conditional on receiving frequency: transmitting frequency > 2 or < 0.5	
Frequency spacing channel 1 to channel 4	80 kHz	200 kHz	600 kHz
RF band width	20 F 3	50 F 3	150 F 3
Sensitivity for 26 dB S/N	< 1 µV	< 1.8 µV	< 2 µV
Start of limiting (2 dB drop)	< 1 µV	< 2 µV	< 2 µV
Adjacent channel selection	≧ 70 dB	≧ 60 dB	≧ 45 dB
AF receiver section			
Output voltage at rated deviation	1.55 V	1.55 V	1.55 V
AF frequency response (– 3 dB) at 100 µV RF	180 Hz to 3 kHz	35 Hz to 12 kHz	35 Hz to 20 kHz
Deemphasis	6 dB/octave or linear	50 µs	50 µs
Distortion factor at rated deviation	< 5 %	< 3 %	< 1 %
Weighted S/N ratio	≧ 50 dB from 15 µV RF	≧ 50 dB	≧ 60 dB from 20 µV RF
RF modulation reserve	≧ 6 dB	≧ 6 dB	≧ 6 dB
Receiver current consumption	approx. 120 mA	approx. 50 mA	approx. 40 mA
Current supply			
Rechargeable battery	15 V, 4 Ah (GZB 4-2)		
Operating time	approx. 2 – 3 hours (transmisson with 10 W and receiving) approx. 5 – 6 hours (transmission with 1 W and receiving) approx. 30 – 100 hours (receiving only)		
Built-in gauge for	battery level, transmitter output voltage, receiver input voltage, transmitter modulation voltage, receiver modulation voltage		
Scope of delivery	SER 10 transmitter with or without receiver Carrying strap GZU 10 Steel band antenna GZA 1 or GZA 2 Battery bos GZB 4-2		
Dimensions with battery box	305 x 135 x 65 mm		
Weight with battery box	approx. 4 kg		

Auxiliary Broadcast Station Receiver

ER 2 and ER 3



ER 2/ER 3

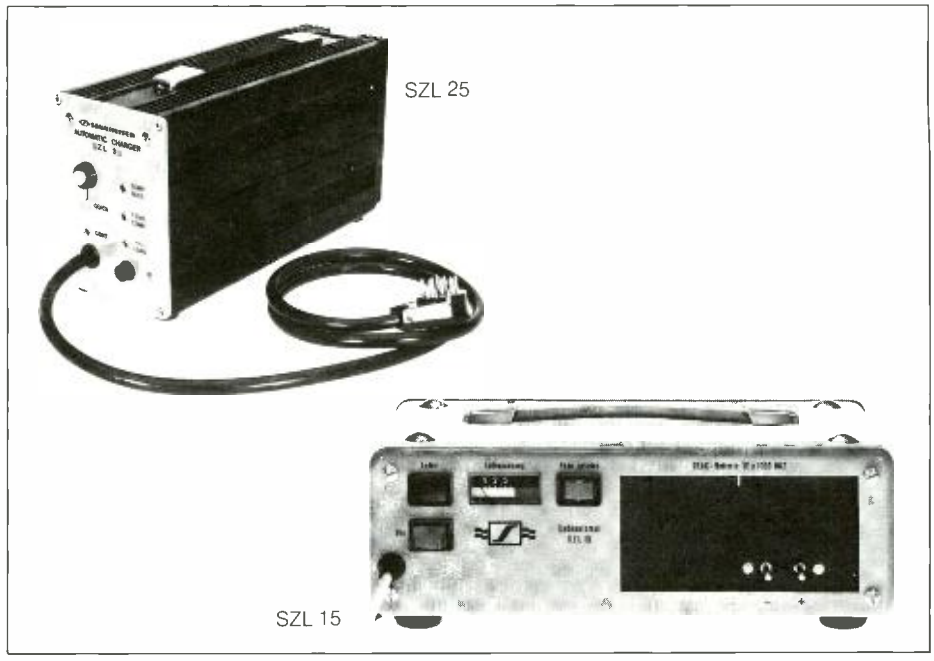
Receivers for high audio quality.
Wideband receiver ER 2.
Narrow-band receiver ER 3.
Wide frequency range of 25 to 145 MHz.
Maximum channel separation 0.5 MHz.
Quartz-crystal oscillators.
Line output and headphone output.
Adjustable squelch.
Rechargeable battery operation, approx. 20 hours.
Leather carrying case.
Shoulder strap and steel band antenna.

The mechanical construction of the Sennheiser auxiliary broadcast station receivers is adapted to the auxiliary broadcast transmitter SER 1. As in the latter, the complete electronic system is incorporated in one unit head, whereas the power supply is coupled by a quick-release clamp to the lower part of the unit. This mechanical approach combines two features, on the one hand the flat battery can be quickly replaced, and on the other, continuous mains operation can be connected through the GZN 10 power unit. A rechargeable battery SER 1-B 5 is included as standard and gives the receiver a 20-hour operating period.
The selectivity of the ER 2 is designed for wide-band modulation. It is capable of handling peak deviations of 75 kHz and is intended for use in the 300 kHz channel separation raster pattern. Under these conditions it is possible to achieve full utilisation of the audio transmission range of 30 Hz to 20 kHz.
The ER 3 version is designed for the 40 kHz channel separation raster pattern. With this narrow channel separation it is essential to adapt to both the deviation and the audiofrequency transmission range. Whereas it has been necessary to comply with telecommunications regulations in dropping the deviation with a maximum of 15 kHz to one fifth of the wideband, the limited reduction in the audio-frequency band width to 12 kHz still permits transmissions in high quality. The ER 3 is popular with West German broadcasting stations on the two available auxiliary broadcasting frequencies of 77.53 and 77.59 MHz.
Both receivers are designed for double superhet reception to achieve a high standard of selectivity. The quartz-crystal oscillators ensure high long-term stability and insensitivity to interference from other carriers.
Adjacent to the line output is a headphone socket for audio-monitoring. The selector switch is used to switch on the unit and shows settings on the moving coil meter for battery level, input voltage to receiver, squelch threshold and the audio-frequency output. The squelch switching threshold is set from the potentiometer knob accessible from the front.
Included as standard with the receiver are a steel band antenna and the leather carrying case with integral antenna in the carrying strap. Owing to its low weight, the receiver can be carried quite easily for many hours operation at a time.

Technical Data:	**ER 2** (Part No 0057)	**ER 3** (Part. Nr 0928)
Receiving frequency	2 frequencies in the range of 25 to 145 MHz, max spacing 0.5 MHz	2 frequencies in the range of 25 to 145 MHz, max spacing of 0.5 MHz, preferably 77 73 and 77 59 MHz
RF input	coaxial 60 Ω (Amphenol connector socket)	coaxial 60 Ω (Amphenol connector socket)
Frequecy stability	3 x 10^{-5}, quartz-crystal controlled	3 x 10^{-5}, quartz-crystal controlled
Reception principle	double superhet	double superhet
1st IF	10.7 MHz	10.8 MHz
2nd IF	470 kHz	455 kHz
Modulation	± 75 kHz deviation (150 F 3)	± 15 kHz deviation (50 F 3)
Sensitivity at 40 or 8 kHz deviation	better than 2 µV for 26 dB S/N	better than 2 5 µV for 26 dB S/N
Selectivity at channel spacing of 0 3 MHz with 40 or 8 kHz deviation	≧ 55 dB at spacing at an interference/useful ratio of 10 : 1	60 dB
Image rejection of 2nd IF	≧ 60 dB	≧ 70 dB
Image rejection of 1st IF	≧ 70 dB	≧ 80 dB
Squelch	switches AF output on single pole via relay	switches AF output on single pole via relay
Squelch switching threshold	adjustable 0 to 5 µV	adjustable 0 to 5 µV
AF transmission range	30 Hz to 20 kHz ± 2 dB	30 Hz to 12 kHz ± 3 dB
Distortion factor at 40 or 8 kHz deviation	≦ 1 %	≦ 3 %
AF output	rated loading 300 Ω, symmetrical and floating, Tuchel T 3082	rated loading 300 Ω, symmetrical and floating, Tuchel T 3082
Impedance	approx 50 Ω	approx 50 Ω
Output voltage	1 55 V for 40 kHz deviation	1 55 V for 8 kHz deviation
Headphone connection	approx. 1 V, R = 1 kΩ	approx 1 V, R = 1 kΩ
Built-in meter for	operating voltage, RF input voltage, squelch level, AF output voltage	operating voltage, RF input voltage, squelch level, output voltage
Function switch	serves simultaneously as On/Off switch	serves simultaneously as On/Off switch
Operating voltage	12 to 16 V	12 to 16 V
Current consumption	50 mA	50 mA
Operation time fully charged	approx 20 hours	approx 20 hours
Rechargeable battery	15 V, 1 Ah	15 V, 1 Ah
Dimensions with battery box in mm	170 x 136 x 65	170 x 136 x 65
Weight of receiver	1 1 kg	1 1 kg
Weight of battery box	0.9 kg	0.9 kg

Battery Chargers

SZL 1010 · SZL 15 · SZL 25



SZL 1010:
Automatic recharger for SK 1010 and EK 1010.
Dual unit.
Digital control of charging cycle.
Accelerated charge with overload protection.

SZL 15:
For rechargeable battery SER 1-B 5.
Electronic charging system with automatic cutout.
Meter and light indicators.

SZL 25:
For quick-charge (1 hour).
Rechargeable battery GZB 4-2.
Triple monitoring system of charging cycle with overload protection.

In the case of battery-operated equipment the user is frequently confronted with the choice as to whether to use dry cells or rechargeable batteries. Frequently, either economic consideration or high load capacity with low voltage loss would support the choice in favour of rechargeable batteries. Sennheiser has taken account of these requirements by using for wireless microphones the 9 V battery for which an equivalent rechargeable battery is readily available. Rechargeable batteries are used to power auxiliary broadcasting transmitters from the time they leave our works. Special battery chargres for these batteries are available in the Sennheiser range.

The SZL 1010 is for recharging batteries used in the SK 1010 transmitter or EK 1010 receiver. This unit is in the form of a double-charger, so that for example in the case of the equipment recommended for lecture halls with one spare transmitter, only one charger is needed. Also the combination of one transmitter with one receiver EK 1010 can be recharged with one single SLZ 1010 unit.

The automatic charging process operates in a multi-phase circuit, whereby an increased charging current in the first stage allows the charging time to be reduced by up to 60%. The digitally controlled cycle then automatically switches over to trickle charge maintaining optimum charge and service life of the rechargeable batteries.

The SZL 15 charger is for automatic recharging of the SER 1-B 5 batteries. These offer a capacity of 1 Ah and are used to power the SER 1-3 and the auxiliary broadcast receivers ER 2 and ER 3. The SZL 15 operates at normal charge, so that a maximum charging time of 14 hours is needed for a completely flat battery. During the charging process the unit carries out an automatic check of the charge level at periodic intervals. The selected check cycle indicates when the battery has been recharged and as soon as this level has been reached the charging current is switched off. The periodic check is continued so that after a longer period of time and partial loss of charge the recharging process can be restarted automatically. The battery charge can be checked at any time by means of pilot lamps and a built-in moving coil meter.

The SZL 25 is an automatic battery charger for quick-charging the GZB 4-2 batteries. These batteries are of the sinter-cell type with a capacity of 4 Ah and can be fully recharged within one hour with the SZL 25. The special feature of this unit is a quick-charge programme controlled by voltage, temperature and time. It ensures a safe and rapid recharge in conjunction with the temperature sensors incorporated in the battery set. After a fastcharge of about 1 hour the unit switches automatically to a reduced trickle charge. LEDs are provided to show the charge function and battery condition.

Technical Data:	**SZL 1010** (Part No. 1478)	**SZL 15** (Part No 0798)	**SZL 25** (Part-No 1675)
Charger for	SK 1010 and EK 1010 with cadmium cells	SER 1-3, ER 2 and ER 3 with cells SER 1-B 5	SER 10 and SER 1-4 with cells GZB 4-2
Charging bays	2	1	1
Charging current	27 mA, 9 mA automatic switchover	100 mA with automatic cutout	4 A, 150 mA automatic switchover
Recharge time, flat battery	approx. 5 hours, max. 8 hours	14 hours	approx. 1 hour
Power supply	110 V/220 V	110 V/220 V	110 V/220 V
Power consumption	4 VA	8 VA	100 VA
Dimensions in mm	160 x 100 x 66	296 x 94 x 165	281 x 150 x 100
Weight	approx. 550 g	3.5 kg	approx. 5.5 kg

Receiver Accessories

EZD 1010 · EZW 1016 · EZW 1016-1 · EZW 1016-2 · GZA 1000 · TA 203

EZD 1010:
Diversity switching unit for EM 1010.

EZW 1016:
Compact RF divider to 250 MHz.
4-way and 2-way distributors.
Wide range of compatibility.

EZW 1016-1:
6-way distributor to 250 MHz.

EZW 1016-2:
6-way distributor with integrated steep-edged filter.

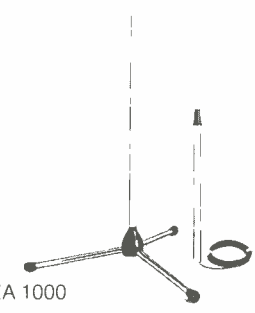
GZA 1000:
Half-wave antenna for 32 to 42 MHz.
Stable tripod and mast clamp.
With 5 m coaxial lead.

TA 203:
Telescopic antenna for EM 1012.

EZD 1010

When using wireless microphones, "dead spots" can arise as a result of multipath propagation. This can be remedied by resorting to a diversity operation to achieve particular operational reliability. A simple diversity mode is possible by using squelch circuits in the EM 1012. However, maximum operating reliability can be achieved with the aid af a combining circuit, whereby 2 EM 1012 units are coupled with the EZD 1010 auxiliary diversity unit. LEDs on the front of the EZD 1010 indicate which receiver is switched through to the output.
The EZW 1016 antenna dividers permit the splitting or combination of RF signals with minimal loss. Combination is employed to bring the signals of several antennae to the receivers in the case of extended systems. Splitting or division is used to distribute the signal from one antenna uniformly to several receivers. The basic EZW 1016 incorporates one 2-way and one 4-way divider, both of which are separated from each other. This permits distribution from a given point to 2 or 4 outputs and vice versa according to circumstances. The 2 built-in dividers permit a large number of different layouts. Numerous combinations are possible with additional EZW 1016, but as the amount of energy available must be spread over the number of units connected, it is not adisable to link too many consumer units to one single source.
The EZW 1016-1 permits operation of up to 6 receivers from 1 antenna.
With the EZW 1016-2 an additional steep-sided 3-circuit helix filter with low insertion loss is fitted. Interference signals lying outside the 4 MHz range are effectively suppressed by the filter. This reduces the danger of intermodulation noise in multichannel systems from transmitters operating outside the waveband being used. The filter can be balanced on a frequency between 130 MHz and 210 MHz.
The GZA 1000 halfwave antenna is suitable for a wide frequency range. It is supplied complete with a stable tripod stand with 3 removable legs. The mast clamp which is also included as standard provides an alternative method for rigging the aerial clear of the ground. A particular feature of this antenna is its considerable insensitivity to environmental influences and the remarkable gain by comparison with a quarter wavelength aerial. The GZA 1000 comes complete with 5 m coaxial connecting lead RG 58 and pigtail ends for fitting the appropriate plug connector for the receiver input socket.
The TA 203 telescopic antenna fits directly into the side socket on the receiver EM 1012. This antenna is particularly suitable for smaller systems and provides considerably better and more cleanly defined transmission values than would be obtainable from improvised antennae. A second, retaining pin prevents the antenna from twisting in the socket.


TA 203


GZA 1000

EZW 1016

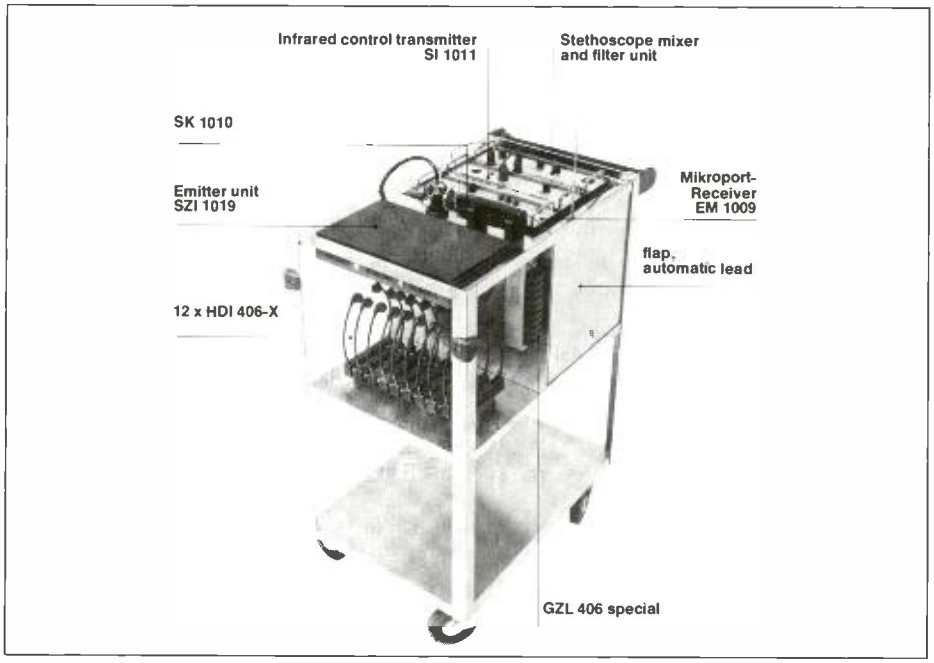
Technical Data:	**EZW 1016** (Part No. 1708)	**EZW 1016-1**	**EZW 1016-2**	**GZA 1000**
Frequency range	30 to 125 kHz	30 to 250 MHz	1 frequency between 130 and 210 MHz, band width 4 MHz	32 to 42 MHz
Distribution loss	3 dB (2-way divider) 6 dB (4-way divider)	8 dB (1 input, 6 outputs)	8 dB (1 input, 6 outputs)	
Insertion losses	1 dB	2 dB	4 dB	
Output decoupling	26 dB	26 dB	26 dB	
Dimensions in mm	168 x 120 x 50	168 x 120 x 50	168 x 120 x 50	
Connecting socket	BNC	BNC	BNC	
Impedance	50 Ω	50 Ω	50 Ω	
Height				3 90 m
Weight				1.6 kg

7 MEDICAL EQUIPMENT

New products have been developed for medical applications through the modification of existing matured technologies. For example Sennheiser has made use of both infrared and RF technologies in this connection. Knowledge accumulated from the application of technology and operational safety and reliability has formed the basis for development of the ausculation trolley, a device which permits wireless transmission of a patient's cardiac heart sounds through infrared headphones. Further developments in RF technology include the Mikroport transmitters and receivers which have proved such a significant aid in enabling students with hearing disabilities to be integrated into normal school education classes. The inherent versatility of Sennheiser products in the service of modern medicine is also emphasised by our "hearing trainer" equipment and the wireless infrared system as well as the range of equipment providing better listening facilities for TV sound.

7 Auscultation Trolley

WA 1010 · WA 1000



Compact unit.
Easily transportable.
Including 10 infrared stethoscope headsets.
Brilliant sound transmission.
Additional commentary via Mikroport system.

In the past auscultatory findings have been extremely difficult to convey to a larger group of people. This problem has now been resolved by our new system, whereby heart sounds are conveyed by wireless transmission of invisible and totally harmless infrared light without any tangle of leads from the sickbed or in the lecture room direct to the students. The physician is able simultaneously with his assistants or students, to make a diagnosis of the heart sounds. Use of the Mikroport system with the WA 1010 model renders it possible to give additional explanatory comments which are also transmitted to the infrared stethoscope headphones worn by the students.

The auscultation trolley

The Sennheiser "Lecture Room" centralised auscultation trolley unit (WA 1010) is equipped as follows:

1 MKE 10 microphone auscultation instrument, rubber tube, triple-head stethoscope
1 stethoscope mixer and filter unit
1 infrared control transmitter SK 1011-X
1 Mikroport receiver EM 1009
1 Mikroport transmitter SK 1010
1 infrared emitter unit SZI 1019
1 battery recharge bar GZL 406, specifically for GZS 406 rechargeable batteries
10 IR stethoscope receivers HDI 406-X
1 battery charger SZL 1010 for SK 1010

The centralised "Bedside Teaching" unit (WA 1000) is supplied without the Mikroport receivers EM 1009, the Mikroport transmitters SK 1010 and without the battery charger SZL 1010.
The system is incorporated in a "Caddinox" hospital trolley and fitted with an automatic mains lead system.

Functional principles of the system

The auscultation noise is transmitted initially from the stethoscope head via the rubber tube to the electret microphone. It is then passed to a stethoscope mixer and filter unit. The filter consists of a switchable, variable band-pass filter with a transmission range of 75 Hz to 1.5 kHz. The band-pass filter can be switched to "high-pass filter" and "band-pass filter" function. The band-pass filter consists of a combination of high-pass and low-pass filters. The high-pass filter allows only high frequencies to "pass" unmuffled, as compared with the low-pass filter with the low frequencies. It can be tuned by hand and thus offers the user the facility for filtering out the frequencies of importance for the desired auscultation signal.
Most of the audible cardiovascular occurrences in case of either health or illness fall within the frequency range of 20 Hz to 1 kHz. The transmission system has a linear frequency response in the range of 50 Hz to 8 kHz (without stethoscope head and rubber tube).
The Mikroport receiver EM 1009 is connected to the mixer input on the mixer and filter unit. Together with the Mikroport transmitter SK 1010 this provides the possibility for the auscultation lecturer to make appropriate comments. The mixer permits fade-in or fade-out of the commentary or auscultation noise. The signal is then fed to the infrared control transmitter SI 1011-X, which amplifies the signal and supplies a control signal for the IR emitter unit SZI 1019.
The infrared emitter unit is integrated in the auscultation trolley and IR transmission is through reflection from the room ceiling to the IR receiver.

Here the IR receiver is the wireless stethoscope headphone HDI 406-X. Owing to physical circumstances the system is limited to enclosed rooms. Use of infrared light as a transmission medium for noise and physiological events also opens up the possibility for conveying palpitation findings. The individual modules in the system have already been in use for some time with considerably success in wireless IR audio transmission and RF audio transmission.

7 Wireless Mikroport System for the Hard of Hearing

Under certain conditions children with a hearing disability can be integrated in normal school classes instead of being obliged to attend special schools for the hard of hearing. The Sennheiser wireless Mikroport system offers an ideal aid to achieve this end.

In virtually every country throughout the world about 0.22 % of all people are born with hearing disabilities sufficiently serious to require special educational facilities it they are not to be left seriously disadvantaged. For example in West Germany alone almost 20,000 children are being educated in such special schools for the hard of hearing. However, it has been found that about 5 to 10 % of these children fulfil the requirements which would permit integration in normal school classes with the aid of the Sennheiser wireless Mikroport technology.

This technical aid is based on the voice of the teacher being picked up from close proximity by a transmitter SK 1010 and transmitted to the child with the hearing disability by means of a Lavalier-type receiver EK 1010 to allow the child to hear clearly. In day to day schooling the procedure is as follows: on entering the classroom the student with a hearing disability puts on the Mikroport transmitter SK 1010 and switches it on before his lesson commences. The child wears the Lavalier Mikroport receiver throughout the entire lesson and it transmits the signal, i.e. the teacher's voice, in excellent quality inductively to the hearing aid of the child.

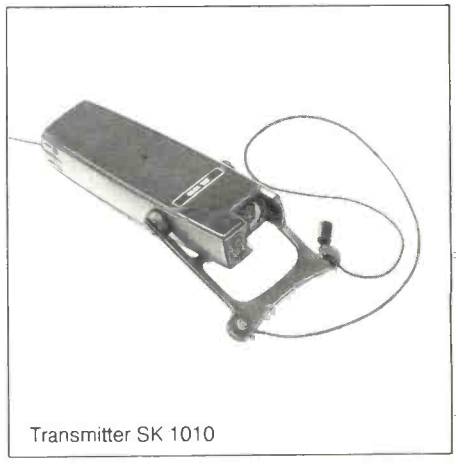
These hearing aids are incorporated in the transmission path because it has been found that every person with a hearing disability has become so accustomed to wearing and using the hearing aid that even a transmission of high technical quality would be less readily understood if the hearing aid were to be bypassed. However, to this is added the fact that the child with a hearing disability in any case uses its existing hearing aid for two additional purposes: on the one hand any verbal contribution to the lesson by class mates, which would not be carried via the teacher's transmitter, must be heard, whereas, on the other hand the child with the hearing disability must be able to hear his or her own voice, which it also picks up via the hearing aid, in order to ensure distinct and correct pronunciation at all times.

How is it possible to recognise the above-mentioned 5 to 10 % of children with a hearing disability and who might be suitable for this mode of integration? A common characteristc of all of the children assisted in this manner to date has been above average intelligence. Obviously this intelligence assists the children to supplement those parts of spoken texts which, despite all technological advances, still remain uncomprehended, to the point where complete sentences are understood and absorbed. Another characteristic of all children thus assisted is a uniformly high degree of spontaneity, a definite motivation to learn and considerable willingness on the part of parents to assist where possible.

The final, but equally important requirement for use of this wireless Mikroport system is a high standard of speech discrimination of at least 70 % in close-talking with the aid of hearing aids which have already been worn for some time by the child in question.

The considerable responsibility involved in furnishing assistance toward integrating a child with a hearing disability into the normal school curriculum has caused Sennheiser Electronic to train a carefully selected number of hearing aid acoustic specialists for making this technology available to children with hearing disabilities. A list of these Mikroport specialist consultants is available from your Sennheiser agent.

Receiver EK 1010



Transmitter SK 1010

7 Infrared Technology for the Hard of Hearing

SI 406 S · SI 406 SX · SI 406 SY · HDI 406 S · HDI 407 S · HDI 408 S

For high quality monaural transmission.
Matched dynamic compression.
Ultra-simple operation.
High reproduction level.
Extremely lightweight receiver.

All previous headphones for transmitting radio/TV sound for the hard of hearing have required a connecting lead, which has repeatedly proved to be the troublesome link in the chain. This connecting lead is no longer required when using Sennheiser infrared transmission systems. The systems used for the hard of hearing are of a special design for the special requirements involved, incorporating matched dynamic compression, which is of particular importance for hearing deficiencies with recruitment, and the reproduction level has been raised to the degree necessary for the hard of hearing. All Sennheiser equipment for the hard of hearing includes the suffix code letter "S". These versions of our equipment are supplied to specialist hearing aid suppliers, who are able to demonstrate the individual devices and also have additional information on other Sennheiser products for persons with a hearing disability.

The SI 406 S is a monaural infrared transmitter with dynamic compression. Otherwise it is identical to the standard SI 406 version.

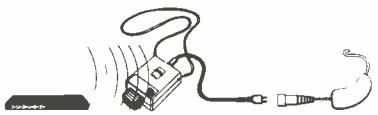
With the SI 406 SX the universal plug connector has been discarded, so that this version can, for example, be connected permanently to a unit by a qualified expert. Other plug connectors can also be matched to the free lead ends.

The SI 406 SY is used for TV sets which do not have a headphone socket as standard. This transmitter is provided additionally with an angled electret microphone for mounting on the side on the TV set, with the microphone itself positioned directly in front of the loudspeaker aperture to pick up the full acoustic quality of the sound. The transmission quality is excellent not withstanding 2-fold transformation through loudspeaker and microphones. The transmitter can be mounted without any need to interfere with the interior of the TV set.

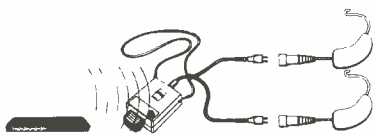
The HDI 406 S is a monaural stethoscope headphone for particularly loud volume. Otherwise the data are identical to those of the standard HDI 406 version (see page 74).
The HDI 407 S is a receiver which can be clipped to the clothing of the user or worn around the neck with a cord. It is intended for connecting up with Sennheiser headphones or other hearing aids.

The HDI 408 S is electrically equivalent to the HDI 407 S, differing only in its mechanical features. It can be connected as sole receiver directly with the special headphones HD 414 S-2.

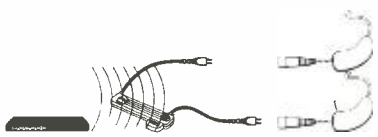
With hearing aid – wireless – one ear



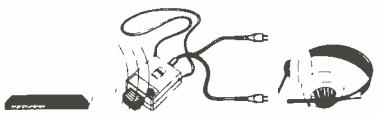
With hearing aid – wireless – both ears



With hearing aid – wireless – both ears – frequent removal

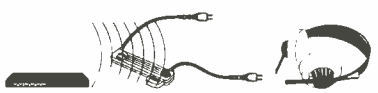


Without hearing aid – wireless – both ears

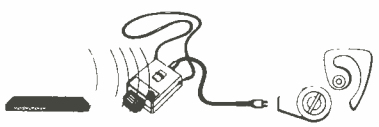


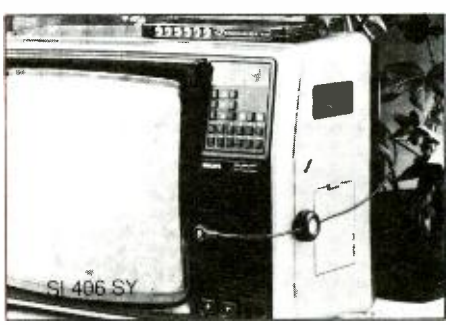
Without hearing aid – wireless – both ears – frequent removal

Without hearing aid – wireless – both ears – particularly comfortable wearing



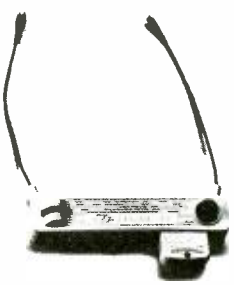
Without hearing aid – wireless – one ear





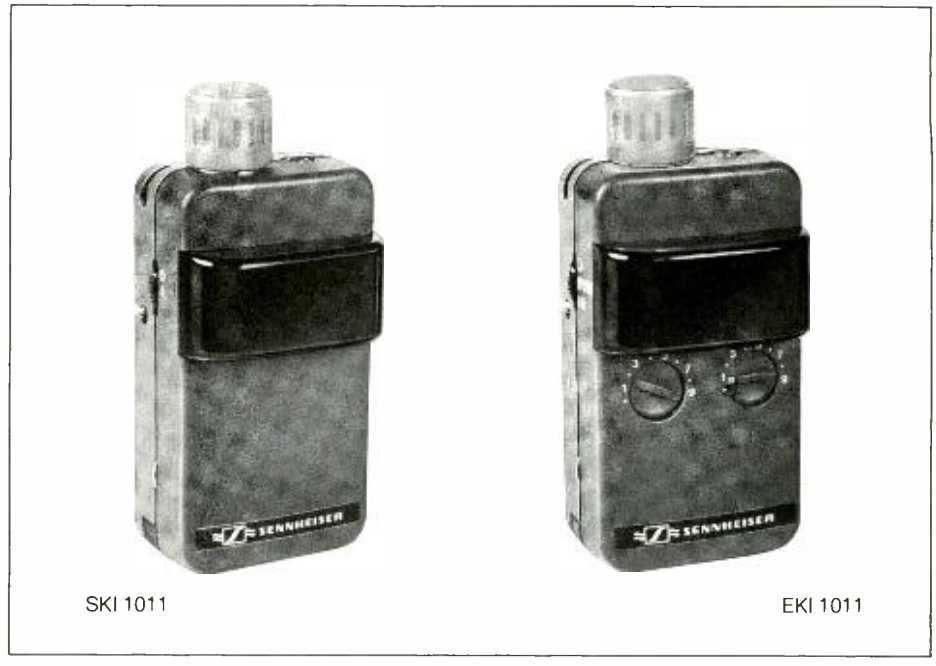

HDI 406 S


HDI 407 S


HDI 408 S

7 Infrared Pulsing System

SKI 1011 · EKI 1011 · SZT 1011 · SZL 1011 · EZT 1011



SKI 1011 EKI 1011

Infrared system with portable, battery powered transmitter.
Comfortable and safe wearing of transmitter and receiver owing to their small, lightweight design.
Adequate coverage in rooms of average size.
No installation work required.

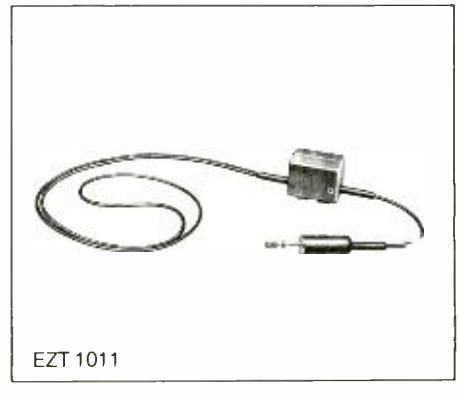
The new 1011 system is a parallel development to the familiar Sennheiser infrared systems. With the portable SKI 1011 transmitter it is possible to pick up the voice of the speaker and to transmit it by wireless via infrared light to the EKI 1011 transmitter. This ensures that the voice which has been picked up clearly and distinctly is conveyed with equal brilliance to the ear of a user, for example a person with a hearing impediment. As with all other infrared systems, this system is used in enclosed rooms where there is no possibility of disruption from unduly bright daylight. This ensures that the information transmitted is limited to the room in question. It is thus possible, for example, to operate identical wireless transmission systems in directly adjacent rooms without any mutual interference, for example in schools.

The portable, battery-operated infrared transmitter has become feasible through the use of the newly developed pulsing modulation system. Despite the fact that it is powered by only three mini-cells, the emitted power of this transmitter is sufficient to give complete coverage in rooms of normal size up to about 30 m^2. The range of operation can be further enlarged with the aid of the SZT 1011 transponder (infrared light pulse amplifier).

When operating transmitter and receiver with rechargeable batteries in place of dry cells, these batteries can be recharged directly in the transmitter or receiver with the aid of the battery charger SZL 1011, which is provided with a quick-charge bay for the more powerful transmitter and a standard charge bay for the receiver.
The sound can be transmitted by wireless system to the hearing aid of the carrier with the aid of induction loop EZT 1011 connected to the receiver EKI 1011.

SZT 1011

SZL 1011



EZT 1011

7 Infrared Pulsing System

SKI 1011 · EKI 1011 · SZT 1011 · SZL 1011 · EZT 1011

Technical data:

	SKI 1011
Radiation power	750 mW
AF transmission range (– 3 dB)	100 to 7000 Hz
Microphone input:	
Input socket	8-pin Tuchel, screw-type
Input impedance	approx. 50 kOhm
Input sensitivity	4 mV for limiter start (to be dropped by 20 dB by deviation control)
Socket wiring connection	pin 1 to AF, pins 2 and 3 to earth, pin 8 to U_B
Line input:	
Input socket	jack socket 3.5 mm
Input impedance	approx. 250 kOhm
Sensitivity for ± 15 kHz deviation	100 mV (to be dropped by 20 dB by deviation control)
Power supply	3 minicells (IEC 6 R) optionally nickel cadmium rechargeable batteries 1.2 V/500 mA/h or alkaline cells
Operating life relative to battery type	approx. 4 hours with nickel cadmium rechargeable batteries, approx. 14 hours with alkaline batteries
Dimensions in mm	100 x 55 x 43
Weight with battery and microphone	approx. 200 g
Colour	black

Rights reserved to adopt modifications, especially in the course of technological progress.

Technical data:

	EZT 1011
Frequency range	300 to 10,000 Hz
Plug connector	3.5 mm diameter jack
Impedance	47 Ohm
Magnetic field strength	100 mA/m at 1 kHz and 10 mVA

Rights reserved to adopt modifications, especially in the course of technological progress.

Technical data:

	SZL 1011
Number of charging bays	2
Charging current	500 mA in quick charge bay, 50 mA in standard charge bay, 9 mA trickle charge
Charge time	1 hour quick charge 14 hours for normal charge
Power supply	220/110 V 50/60 Hz + 20 % – 15 %
Dimensions in mm	160 x 165 x 75
Weight	1200 g
Colour	grey

Rights reserved to adopt modifications, especially in the course of technological progress.

Technical data:

	EKI 1011
Output:	
Output connection	3.5 mm diameter jack connector
Impedance	min. 50 Ohm
Output	50 mW to 50 Ohm
AF frequency response	100 to 7000 Hz
Input:	
Input connector	8-pin Tuchel connector, screw-type
Impedance	approx. 3 kOhm
Sensitivity	approx. 1 mV (for limiter start)
Connector wiring	pin 1 to AF, pins 2 and 3 to earth, pin 8 to + V_B
Power supply	3 mini-cells (IEC R 6) optionally nickel-cadmium rechargeable batteries 1.2 V, 500 mA/h or alkaline cells
Operating time relative to battery type	approx. 20 hours with nickel-cadmium rechargeable batteries, approx. 72 hours with alkaline cells
Dimensions in mm	100 x 55 x 43
Weight with batteries	approx. 180 g
Colour	black

Rights reserved to adopt modifications, especially in the course of technological progress.

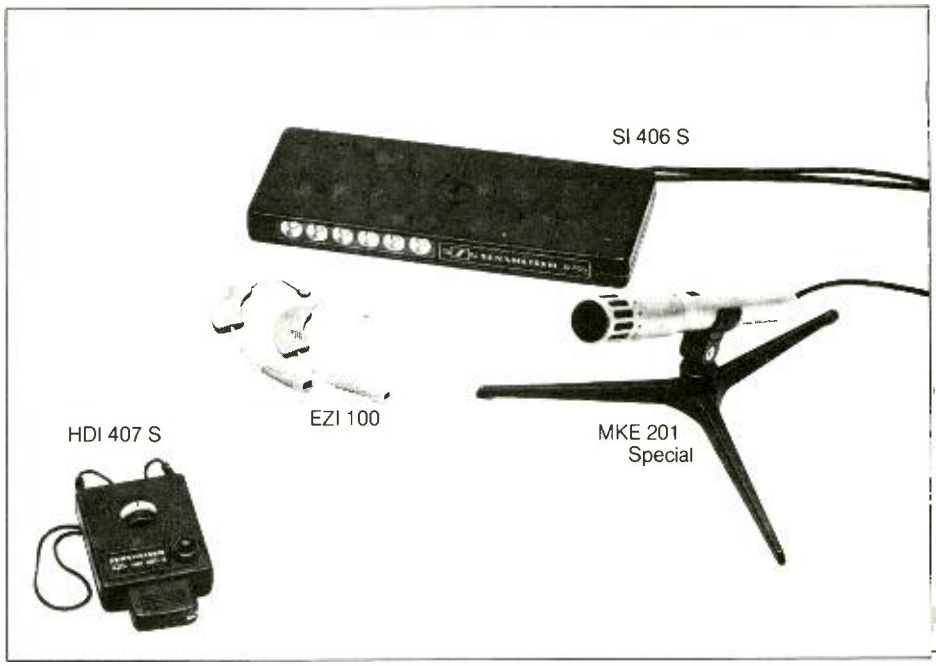
Technical data:

	SZT 1011
Emitted power	> 2500 mW (pulse light output)
Number of transmitter diodes	35
Room area coverage	more than 80 m^2
Number of receiver diodes	8
Supply voltage	220 V/110 V + 20 % (resolderable) – 15 %
Power consumption	no load approx. 3.5 VA, max. approx. 10 VA
Maximum pulse repetition rate	80 kHz ± 10 %
Transmission pulse width	1 µs ± 10 %
Dimensions in mm with cover for transmitter and receiver diodes	140 x 100 x 53
Weight	approx. 1000 g
Colour	black

Rights reserved to adopt modifications, especially in the course of technological progress.

7 Hearing Trainer

MKE 201 special · SI 406 S · HDI 407 S · EZI 100



Portable, thus suitable for use in a different room at any time.
Maximum freedom of movement for the user.
Extension by additional infrared receiver.
Easy matching to existing hearing aid.
User-monitoring by speaking into microphone.

The hearing trainer is a highly promising aid for the training of patients with a hearing and speech disability. With the aid of this system the training information is brought directly to the ear of the patient. Sennheiser has pioneered a new approach with this system. With the aid of infrared technology it is now possible for teachers and students to complete the training programme in physical isolation from each other, i.e. by wireless system. This means that each person concerned has considerable freedom of movement. The teacher or instructor speaks into the MKE 201 special electret microphone, which is linked with the SI 406 infrared transmitter. The microphone picks up words and sounds which are then radiated by the infrared emitter. The student carries the infrared receiver HDI 407 on which the induction loops EZI 100 are located. These tiny wafers are clamped to the ear behind the hearing aid, thus ensuring a direct transmission of sound to the hearing aid. The adjustment of frequency control elements (tone control) and the maximum sound pressure level is eliminated, as the hearing aid has already been adapted to the wearer. It is now no longer necessary to make any technical adjustment of the type which has otherwise been customary with hearing training equipment.

8 AUDIO STUDIO EQUIPMENT

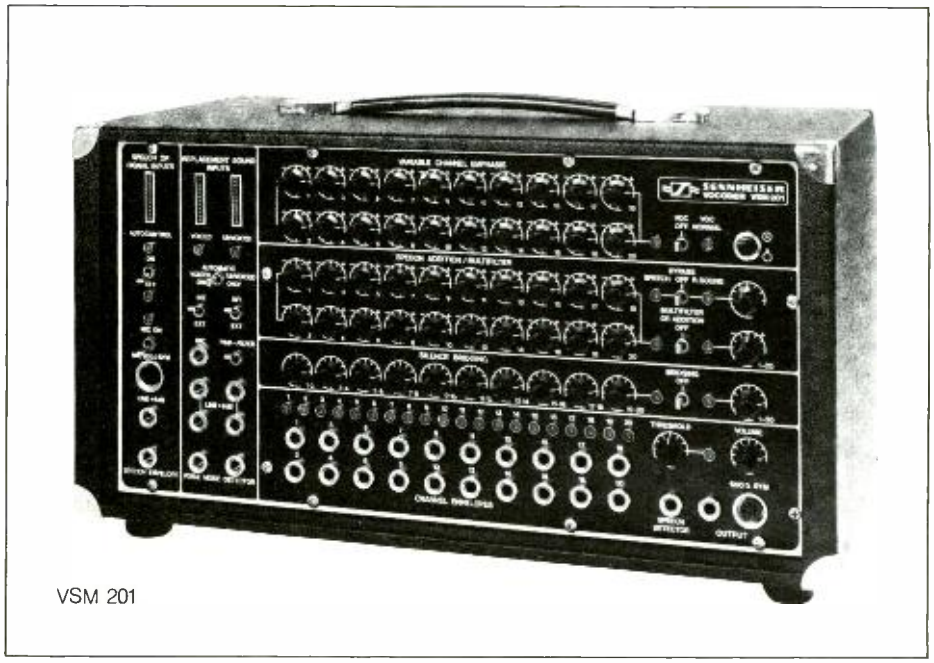
Audiofrequency transmission units which would satisfy the studio requirements of today were among the first products manufactured by Sennheiser. Over the intervening decades there has been continuous change and development in this range of products. Where we were initially producing power amplifiers, transmission systems evolved subsequently through to one of the first active loudspeaker boxes. Technical innovations constantly replaced existing models. The M 101 auxiliary broadcast portable mixer desk proved particularly successful.

Sennheiser lays particular emphasis on adapting the range of audio studio equipment to the specific requirements of the profession. Consequently the range always offers technically advanced products with characteristics and features which guaranntee maximum user benefit. Analytical work in the field of speech and music has opened up the area of signal processing technology. One particular example of such signal processing is the vocoder, with its immense variety of applications for the production of speech and music. The vocoder fits ideally into the overall Sennheiser range of products, which is based essentially on speech and music, whether in connection with microphones, headphones or test and measuring equipment.

The following listing gives details as to the pages on which you will find the individual products in the audio studio equipment group.

8 Sound Effect Vocoder

VSM 201



VSM 201

For a wide variety of speech and music effects.
For rhythmic alternations.
Built-in multifilter.
Automatic interval filling.
Adjustable bypass.
Envelope outputs.
Built-in noise generator.
LED modulation displays.

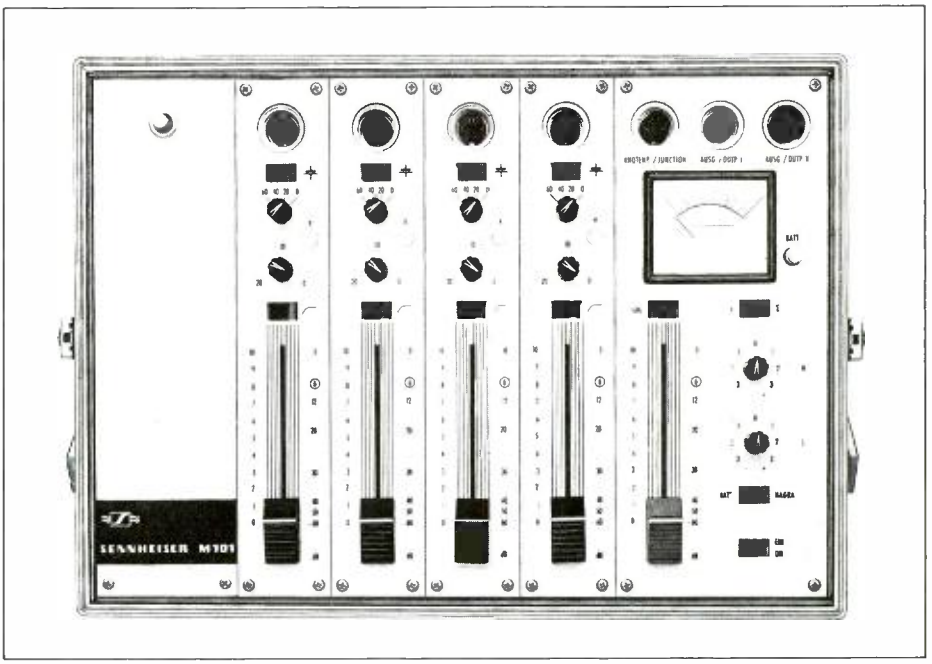
In recent years the quest for new sound forms and effects has led to the evolution of a large number of electronic instruments through to the present-day synthesizer. The VSM 201 sound effect vocoder now opens up the possibility for including the human voice in such "sound expansion" developments. In a further stage it is also possible to leave the speech signal again so that any desired types of signal are available to the vocoder inputs. Co-ordination of the vocoder and the various sources thus permits a variety of sound effects unequalled by any other equipment.
All vocoders found their origin in the area of speech transmission. The basic concept is a total analysis of the speech signal, transmission of its characteristic data and renewed synthesis at the reception point.
Whereas with the original vocoder speech generation or speech reconstitution sounding as "genuine" as possible gave rise to the greatest amount of technical outlay, in applications to the artistic sector any similarities between the original spoken or sung input or music source and what the vocoder is able to deliver at the output is highly undesirable. However, to the extent that a proportion of speech is included in the input, the text should remain comprehensible. The greater the distance and dissimilarity from the original acoustic pattern of the input signals, the more interesting the vocoder becomes for artistic and dramatic applications in radio plays, filming, television and on the stage. The vocoder is fully capable of multiplying the voice of one individual pop singer or transposing the range of the singer's voice over anything up to 8 octaves.
For as long as speech is fed into one input, it is possible with the vocoder to create the illusion of "speech" from instrumental or other noises fed into the second input. Speaking monophonic or polyphonic musical instruments, speaking wind, an engine complaining of poor combustion, the sound of church bells or the synchronous slogans of encouragements from an otherwise incomprehensibly roaring crowd of football supporters are only a few examples. At the same time the automatic interval filling ensures that the character of the inital signal remains intact.
If in the next stage the speech is left as an articulation signal, additional instrumental effects not hitherto produced can be generated. Combination of a drum with a trombone leads to a "drummed" trombone, a sound which is impossible to imagine without practical demonstration.
As a result of the distribution in the channel vocoder of the transmission spectrum to a large number of individual channels, it is possible with the level controls to use the vocoder also as a 20-channel multifilter. It therefore offers additional scope for variety in the production of music.

Technical Data:

	VSM 201
Number of channels in the filter bank	20 channels
Spectral range	100 to 8000 Hz
Mains voltage	220 V ± 15 % ± 110 V ± 15 %
Automatic switchover between 110 V and 220 V range	
Poewr consumption	approx. 18 VA
Mains frequency	50 to 60 Hz
Speech signal inputs	+ 6 dB, 100 kΩ asymmetrical 2 5 mV, 200 Ω symmetrical
Equivalent signal inputs	+ 6 dB, 100 kΩ asymmetrical 2.5 mV, approx. 5 kΩ asymmetrical
Signal outputs	+ 6 dB asymmetrical – 20 dB asymmetrical
Housing dimensions w x h x d	approx. 475 x 270 x 235 mm
Weight	12.5 kg
Carrying case dimensions, w x h x d	approx. 600 x 380 x 360 mm
Weight	7.7 kg

Auxiliary Broadcast Mixer Panel

M 101 · M 101 U



Lightweight unit for mobile use.
Studio transmission quality.
Battery operation with low power consumption.
High sensitivity (0.1 mV).
Output level + 6 dB.
Output transmitter suitable for expansion to 6, 9 or 15 dB.
Built-in level tone generator.
Peak voltage indicator.
Treble-bass equaliser in summation.
Mains module available.

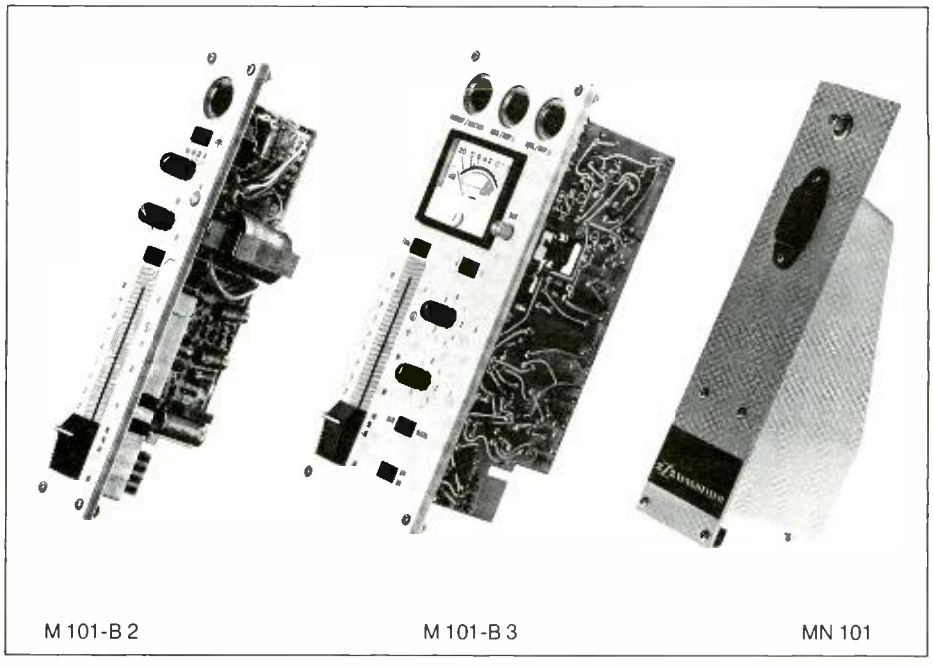
The M 101 transmission mixer desk is designed mainly for professional and semi-professional use. When used in conjunction with a portable tape recorder this forms a handy and readily portable unit.
The basic version of the unit has inputs and outputs with screw-type connector sockets to DIN 45524 specifications. The M 101 U version is fitted with built-in plug connectors to accommodate Cannon lead couplings.
In addition to dynamic and condenser microphones with their own power supply, condenser microphones with AB supply can also be connected to the inputs. The AB power is supplied from the unit and is adapted to the power capacity of the high quality HF condenser microphones. The AB supply can be switched off individually in each microphone channel for the operation of dynamic microphones. Each microphone module also incorporates a switchable bass cut filter which drops frequencies below 100 Hz by about 10 dB per octave. The level is set by means of a graduated selector switch, a rotary potentiometer and a slide potentiometer. The graduated selector switch is intended for rough attenuation, fine adjustment between the individual stages is with the rotary potentiometer and the slide potentiometer is provided for actual channel operation with fade-in and fade-out. The overload capability of the input stages is approximately 26 dB and is reduced to 20 dB by the time it reaches the summing amplifier. A pushbutton control on each microphone channel switches through a pre-listening path to a summing point in the mixing module. The outputs of the microphone channels are fed via booster amplifiers and decoupling resistors to the master slide-fader which is carried on a separate socket to allow a second M 101 mixer desk to be coupled in parallel.
The summing module incorporates separate equalisers for treble and bass control in addition to the main potentiometer which is also of the slide-type. These equalisers can be switched as required jointly to the summing amplifier or to the fourth microphone channel. A built-in oscillator provides a defined line-up tone. The output voltage is shown directly on the summing module with a peak voltage meter. A pushbutton control also permits the supply voltage to be read from the instrument. The output power of the summing module is generated by a push-pull output amplifier with a very low output impedance. A symmetrical transformer is also available for the M 101 to permit an output level of 6, 9 or 15 dB by appropriate tapping. A reversing switch permits the power supply to be taken from the powering module or from an external supply line. The basic power supply is in the form of a battery module, accommodating two 9 V batteries, size IEC 6 F 100. This module can be interchanged with the MN 101 mains unit for powering from the 200 V lighting system. An external supply voltage can, for example, be taken from the Nagra portable tape recorders.

Technical Data:

	M 101 (Part No. 0272) **M 101 U (Cannon)** (Part No. 0274)
Inputs	4, symmetrical, floating
Input sensitivity	0.1 mV to max. 1.55 V
Input attenuator	3 positions, 20 dB stages, additionally 20 dB stepless control in feedback circuit of the first amplifier stage
Input impedance	120 to 12 kHz ≧ 1 kΩ, 40 Hz to 50 kHz ≧ 400 Ω with attenuator = 1.8 kΩ
Input symmetry	40 Hz to 15 kHz ≧ 60 dB
Bass cut filter switchable in each input	120 Hz frequency start (– 3 dB) 10 dB per octave below 100 Hz
Power for AB capacitor microphones	switchable by hand in each input
Output	asymmetric, + 6 dB to 60 Ω u + 6 dB source impedance 18 kΩ
Output impedance	< 4 Ω
Frequency response	40 to 15,000 Hz ± 1.5 dB
Distortion factor	0.5 % 60 Hz to 15 kHz (+ 6 dB at output to 200 Ω) 1 % 60 Hz to 15 kHz (+ 12 dB at output to 200 Ω
Noise factor	approx. 3 dB
Summing point noise (all microphone faders closed, master fader fully open)	– 65 dBm weighted to DIN 45 405 – 77 dBm weighted to DIN 45 405
Peak level meter	build-up time to 90 % full deflection: 30 ms final oscillation time: 1.4 sec.
Line-up generator	Frequency 1 kHz ± 15 %, distortion factor ≦ 1 %, level adjustable by master fader
Equaliser, switchable to master channel or input IV	treble control ± 12 dB at 15 kHz bass control + 10 dB to 14 dB at 40 Hz
Temperature range	– 20 ° C to + 50 ° C
Power consumption	40 mA at full modulation
Batteries	2 x 9 V Ever Ready No. 276 or equivalent (IEC 6 F 100)
Battery life in intermittant operation	30 hours with 4 AB condenser microphones 20 hours
Dimension in mm	347 x 233 x 126
Weight (with batteries)	6 kg

Individual Modules

M 101-B 2 · M 101-B 3 · MN 101



M 101-B 2 M 101-B 3 MN 101

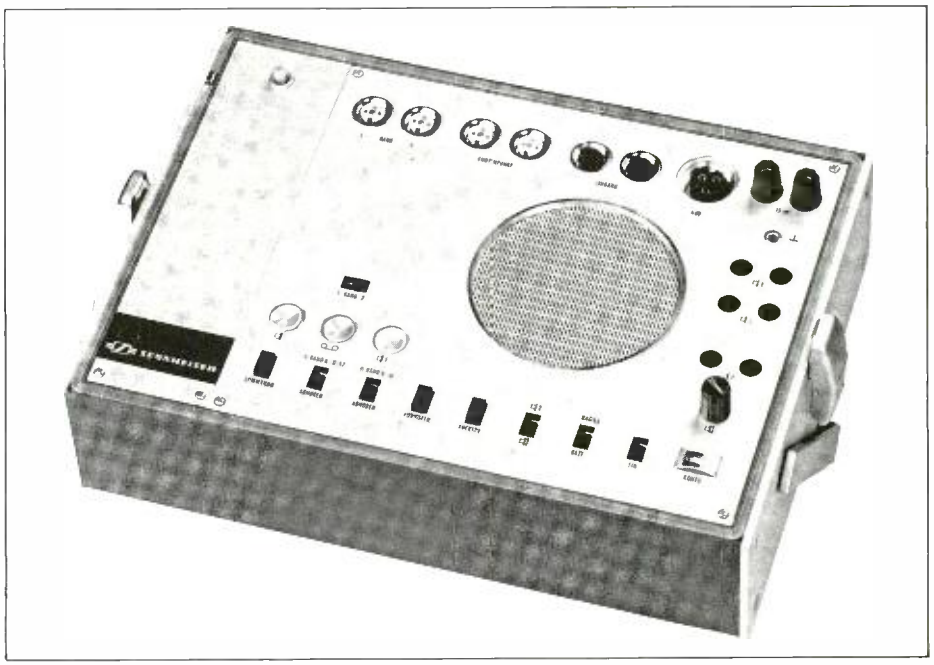
Flexibility through use of individual modules.
Microphone module M 101-B 2.
Master amplifier M 101-B 3.
Power supply MN 101.

Both stationary and mobile mixer units in the professional and semi-professional area can be expanded as required with the aid of the M 101 module range. The modular principle permits virtually any desired number of channels to be combined to create either monaural or stereo systems of studio quality. Electrical coupling of the modules is extremely simple: all units are marked unmistakeably on the PCBs showing the input voltage, prelistening line and the modulation line. The appropriate PCB connector strip is included as standard. The MN 101 mains unit available for power supply purposes in the Sennheiser range is capable of powering up to 2 master amplifiers and 10 to 20 microphone modules, depending on the type of microphone used. There are no obstacles to the use of more powerful mains units for larger systems.

Technical Data:	**Microphone module M 101-B 2** (Part No. 1023)	**Master amplifier M 101-B 3** (Part No. 1024)	**Mains unit MN 101** (Part No. 0981)
Input/inputs	symmetrical	4, asymmetrical 1 prelistening line looped	
Rated input impedance	200 Ω		
Input level	0.1 mV to 1.55 V		
Input attenuator	3 positions in 20 dB stages, also 20 dB stepless control in the feedback of the first amplifying stage		
Input impedance	120 Hz to 12 kHz ≧ 1 kΩ 40 Hz to 15 kHz ≧ 400 Ω with attenuator = 1.8 kΩ	≧ 10 kΩ	
Input symmetry	40 Hz to 15 kHz ≧ 60 dB		
Basscut filter, switchable	120 Hz start frequency (– 3 dB) 10 dB per octave below 100 Hz		
Power supply for AB capacitor microphones	12 V, switchable		
Outputs	signal: asymmetric 250 mV prelistening: 50 mV, Ri = 22 kΩ	asymmetric + 6 dB to 200 Ω and + 6 dB to 18 kΩ nodal point. impedance = 10 kΩ level approx. 40 mV	
Terminating resistance of signal output	≧ 10 kΩ		
Frequency response	40 to 15,000 Hz ± 1.5 dB	40 to 16,000 Hz ± 1.5 dB to DIN 45 500	
Distortion factor	≦ 2 % 60 Hz to 15 kHz	0.5 % 60 Hz to 15 kHz (+ 6 dB at output) to 200 Ω 1 % 60 Hz to 15 kHz (+ 12 dB at output) to 200 Ω	
Noise factor	3 dB		
Temperature range	– 20 ° C to + 50 ° C	– 20 ° C to + 50 ° C	
Service voltage	12 V ± 1 V	18 V, – 3, + 6 V	
Power consumption	approx.5 mA, approx. 10 mA with condenser microphone	20 mA	
Dimensions in mm	215 x 40 x 70	215 x 89 x 70	
Weight	380 g	690 g	
Input sensitivity		250 mV	
Output impedance		≦ 4 Ω	
Noise at output with fader closed		77 dBm weighted to DIN 45 405	
Modulation monitor		Build-up time to 90 % full deflection 30 ms	
instrument (peak voltage meter)		final oscillation time 1.4 sec	
Level tone generator		Frequency 1 kHz ± 15 % distortion factor ≦ 1 % level adjustable with fader control	
Equaliser, switchable into master amp or input IV		level control ± 12 dB at 15 kHz bass control ± 10 dB, – 14 dB at 40 Hz	
DC output			18 V (to 140 mA) approx. 16 V at 180 mA
Superimposed interference voltage at 18 V			< 1 mV
Mains conection			220 V ac, 50 to 60 Hz, resolderable to 110 V
Power consumption			4 VA
Dimensions in mm			215 x 60 x 70
Weight			approx. 500 g

Mixer Monitoring Unit

ML 101



Supplementary unit for M 101.
Input for two M 101s.
Built-in loudspeaker.
Prelistening output.
Signal path cueing.
Feedback cueing.
Loudspeaker doubles as cue microphone.
Tape monitoring of direct and off-tape levels.
Suitable for battery or mains operation.

The ML 101 monitor unit has been developed to expand the versatility of the M 101 4-channel mixer unit. Combination of the M 101/ML 101 units offers operating and monitoring facilities which have hitherto been available only with large fixed mixer systems. It permits direct and off-tape monitoring as well as pre-fade listening by headphone or built-in loudspeaker. Cues can be superimposed on the useful signal or fed back separately, for example to the cameraman or reporter.
The monitoring unit incorporates 2 4-Watt amplifiers. One amplifier triggers either the built-in loudspeaker or the headphone output and performs the following monitoring functions:

1. The output signal of the mixer desk can be monitored (direct tape monitoring).
2. Off-tape monitoring is possible by simple switch-over. Two symmetrical floating tape recorder inputs are provided for this purpose. The direct and off-tape signal can be balanced to a common level by means of a rotary potentiometer.
3. The signal at the input of the microphone channels can be monitored with the channel fader down by pressing the pre-fade listening button in the M 101.
   The second amplifier feeds two headphone outputs coupled in parallel, through which it is possible to monitor the output signal of the mixer units or to feed it to a cameraman or interviewer. This path can also be used for cueing. For this purpose a button is provided to allow the built-in loudspeaker to be used as a microphone.
   A link with the summing point of mixer unit M 101 permits superimposing of cueing via the mixer unit output to a connected tape recorder. Here, also, the loudspeaker is used as a microphone.

The monitoring unit also incorporates a transformer which is linked via a decoupling amplifier with the mixer unit output and generates a level of 15 dB via a secondary winding. The symmetrical + 6 dB output is fed to a large 3-pin Tuchel connector and the + 15 dB output to two unit terminals.
The appropriate inputs are duplicated for parallel connection of two M 101 units to the ML 101 monitor unit.
The unit is incorporated in a housing with the same dimensions as the M 101 mixer. As with the latter, it can be powered by the built-in battery pack, the interchangeable MN 101 mains unit or via an external dc line. A small moving coil meter indicates the supply voltage level.

Technical Data:

	ML 101 (Part No. 0385)
Inputs:	
1. Two inputs for connecting the M 101	asymmetric
Sensitivity	1.55 V
Input impedance	5 kΩ
2. Two inputs for pre-fade listening	asymmetric
Sensitivity	80 mV
Input impedance	120 kΩ
3. Two inputs for direct monitoring	symmetrical, floating
Sensitivity	300 mV adjustable
Max. permissible input level	2 V
Impedance	20 kΩ
Outputs:	
1. Output for modulation	symmetrical, floating
Output leve 1	+ 6 dB to 200 Ω
Output leve 2	+ 15 dB to 600 Ω
2. Headphone outputs	asymmetric
Output level	max 4 V adjustable
Minimum load impedance	4 Ω
Temperature range	– 20 ° C to + 50 ° C
Current drain, no load/monitoring	35 mA/100 mA
Dimension in mm	347 x 233 x 126
Batteries	2 x 9 V Eveready No. 276 or equivalent (IEC 6 F 100)
Weight (with batteries)	6 kg

9 AUDIO TEST INSTRUMENTS

The very first range of products manufactured by Sennheiser included gauges and measuring equipment for use in laboratories and workshops. For many years the impedance, inductance and capacitance measuring devices developed at that time have been in use throughout the world. Consistent with Sennheiser's progressive approach it was obvious that facilitites should also be developed for the measurement of audio voltage levels with the aid of microphones or appropriate reproduction facilities. It was in this way that the first electron tube volt meters were originated by Sennheiser. Over several generations these electron tube volt meters have been refined to culminate, with an appropriate range of accessories, in universally applicable measuring facilities for the audiofrequency sector.

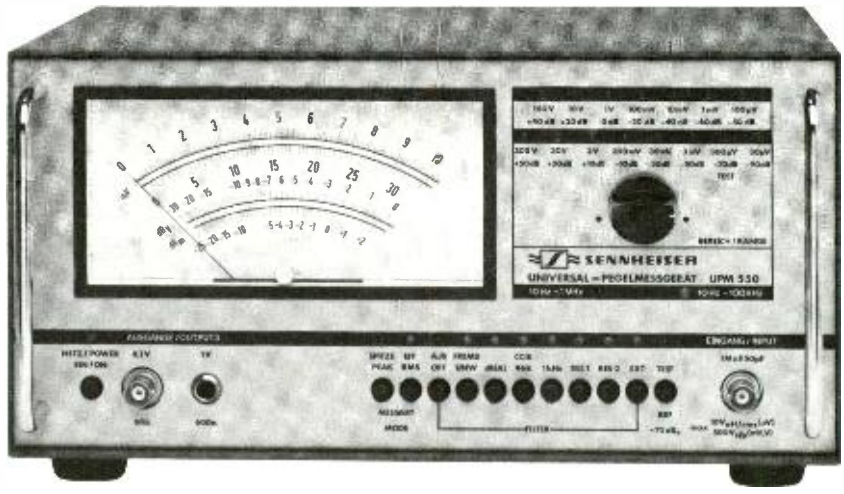
Until recently it was possible to assemble a complete test and measuring installation using an electron tube volt meter and the appropriate accessories. This also permitted weighted measurements in accordance with various standard specifications and characteristics (peak value readings).
The UPM 550 universal level meter now offers in compact form greatly expanded measuring possibilities by comparison with the previous conventional layout comprising numerous individual instruments: interchangeable plug-in boards permit a comprehensive measuring system to be assembled for a diverse range of applications in audio measurement technology.

The UPM 550 and the range of plug-in filter boards available as standard are described in the following.

Universal Level Meter

UPM 550 · UPM 550-1 · RVZ 11-1

Universal measuring system.
Frequency response 10 Hz to 1 MHz.
15 measuring ranges: 30 µV to 300 V.
High input sensitivity.
Built-in noise weighting filter.
Built-in psophometric voltage filter.
Space for two reserve filters.
Numerous special optional filters.
Additional external filter connection.
High accuracy.
Steady measurement readings.
Linear scale.
Built-in calibration generator.
True RMS measurement.
Peak value measurement to DIN 45405 specifications.
Rugged design.



UPM 550

The fully transistorised UPM 550 universal level meter is designed for ac voltage measurements within the range of 10 Hz to 1 MHz. It offers an extremely high sensitivity of 30 µV for full deflection within the range of up to 100 kHz. The 15 overlapping measuring ranges can be selected by an extremely easily operated rotary selector switch. The inputs are protected against overload. A psophometric voltage filter to CCIR 468-1 specifications, a 1000 Hz filter for selective measurement and the A-noise weighting filter together with the psophometric voltage filter for measurements to DIN 45500, page 4, are permanent fixtures. The modular assembly for easy servicing permits simple plugging in of a maximum of 2 additional filters. Connection sockets on the back of the unit are provided for external 600 ohm filters. The insertion loss of such filters can be balanced within the range of 1 dB to 15 dB by means of a potentiometer. The unit is compatible for stacking with the existing range of Sennheiser measuring equipment.

All amplifiers in the UPM 550 are designed for high overload protection. The filter preamp can be modulated with a sine voltage by more than 50 dB over the full deflection of the instrument without distortion. This ensures avoidance of measuring errors owing to excessive amplitudes in the attenuation range of the filters. Trouble-free measurement is thus also permitted by an octave or third octave band filter plugged into the external filter connection. With the aid of the built-in 1000 Hz filter it is also possible to determine the distortion factor of a sine voltage. For example it is possible to determine the level of a tape recorder for full modulation by measuring the third harmonic of a recorded 333 Hz signal. Erasure attenuation measurements can also be carried out at 1000 Hz. The overload resistance of the end amplifier is sufficiently great to tolerate without distortion transient peaks with a magnitude of 10 times the amplitude of a sine voltage required for full meter deflection.

In the measurement of distortion factors, am modulation factors, noise and psophometric voltages, the UPM 550 delivers unfalsified readings owing to the true RMS rectification. The peak value rectification corresponds to standard specification DIN 45405 required for psophometric voltage meters. The LED display for all measurement ranges and operating modes and a large flat arc scale simplify both operation and reading. In addition to the readings it provides, the unit can also be used as a highly stable wideband and monitoring amplifier.

An integral 1000 Hz calibration voltage generator with high voltage and frequency stability guarantee convenient monitoring of the reading accuracy at all times. As virtually all standardised filters display an attenuation of 0 dB at 1000 Hz, they can also be calibrated with this unit. The meter face has two voltage scales which are used alternately in the sequence of the measurement ranges, so that the indicated value simply has to be multiplied by 10. The additional db scales permit easy level measurements in conjunction with the 10 dB graduation of the measurement ranges. The dBm values are related to 0.775 V (corresponding to 1 mW to 600 ohm). A dBv scale is provided for reference to 1 V.

In addition to the reading shown on the meter, the signal to be measured at the output connector (60 ohm) can be depicted on an oscillograph and a headphone, e.g. HD 414-13, can be plugged in with a 6.3 mm jack connector (600 ohm) for listening purposes. The inputs and outputs are fitted with BNC connectors to ensure precise measurements also at higher frequencies. If the user prefers a symmetrical measurement in the AF range, the input voltage can be balanced by means of the RVZ 11-1 series transformer.

UPM 550-1

In addition to all of the measuring facilities of the UPM 550, the UPM 550-1 offers the following special features:

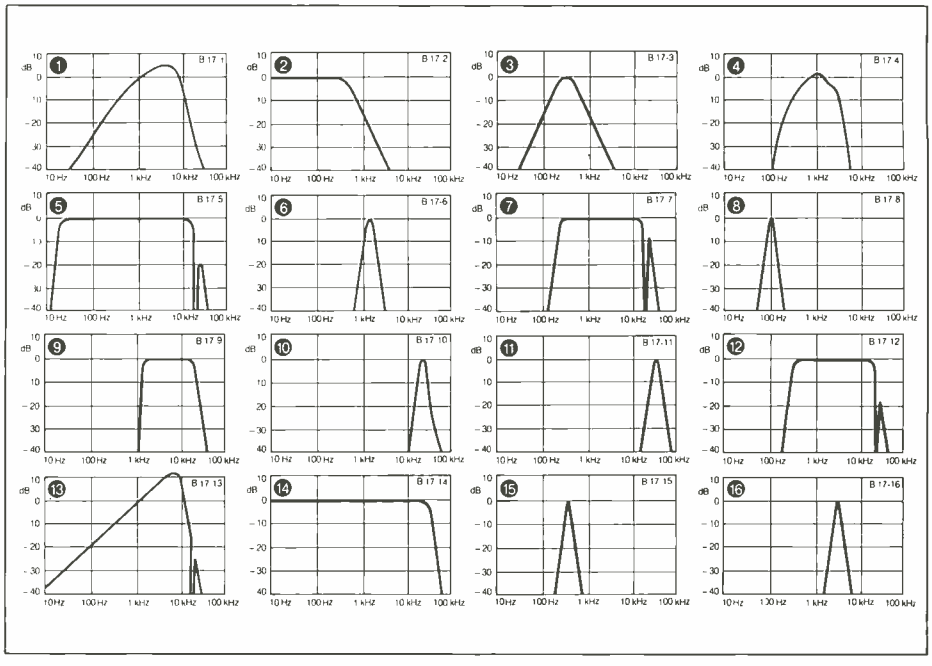
1. Two switchable inputs for measurement on stereo equipment.
2. Plugged-in basic board UPM 550-B 17 carrying supplementary UPM 550-B 17-9 for distortion factor measurements.
3. Disconnectable level adjuster for the instrument reading. This allows the reading to be adjusted to any desired reference level.
4. As the basic board already carries a supplementary filter, space has been left for only one additional supplementary filter.
5. Owing to the larger amount of space required on the front panel the handle has been replaced by capped nuts.
6. The volt and dB scale has been interchanged in the reading display instrument. This permits better read-off of the dB values on the dBm graduation which is now lying in the upper scale sector. To still retain a voltage scale of adequate size the dBv scale has been discarded.

Abbreviated technical data

Voltage measurement ranges	0 to 30/100/300 µV, 1/3/10/30/100/300 mV, 1/3/10/30/100/300 V
Frequency response in peak value rectification	10 Hz to 1 MHz (ranges 1 mV to 100 V) 10 Hz to 100 kHz (ranges 30 µV to 300 µV and 300 V)
Frequency response for RMS rectification	10 Hz to 100 kHz (all ranges)
Input impedance	1 M/50 pF
Output for	external filters, headphones and oscillographs
Built-in filters	DIN external voltage, dB(A) psophometric voltage, CCIR psophometric voltage, 1000 Hz selective
Optional plug-in filters	1 or 2 on plug-in base board
Frequency of the built-in calibration monitoring voltage	1000 Hz
Mains connection	45 to 60 Hz, 180 to 250 V in 220 V operation 90 to 130 V in 110 V operation
Dimensions	294 x 195 x 156 mm
Weight	approx. 6 kg

UPM 550

Filter Cards



Supplementary filter for UPM 550.
Simple connection using special socket strip.
Maximum 2 units for retrofit.
Operation by "Reserve" buttons on UPM 550.

The Sennheiser supplementary filters are matched ideally to the UPM 550. They are in the form of PCB modules and can be used either directly in the UPM 550 or by way of the supplementary basic card UPM 550-B 17. A maximum of two supplementary filters can be fitted in the reserve positions in the UPM 550. The filter is switched on or off by means of the two reserve filter buttons on the front of the UPM 550. No action is required beyond insertion of the fitted basic board. All filters are supplie with precise balance.
The basic board UPM-B 17 is used to accommodate a maximum of two filter modules from the UPM 550-B 17-1 series through to the UPM 550-B 17-16. Each of these modules is mounted on the basic board and secured by two screws. The basic board plug strip plugs into the socket provided in the UPM 550 and makes all necessary connections.

1. Filter module UPM-550-B 17-1 incorporates the circuit noise filter to DIN 45 405 specifications (1967 version). The filter is particularly popular for studio use. It still remains in use at present, although circuit noise measurement is shortly to be superseded by CCIR 468-1.
2. Filter module UPM-B 17-2 incorporates an extraneous voltage filter for rumble to DIN 45 539 specifications. This is particularly suitable for the evaluation of turntable drives.
3. Filter module 550-B 17-3 incorporates a circuit noise filter for rumble measurements to DIN 45 539 and supplements the aforesaid extraneous voltage filter.
4. Filter module UPM-B 17-4 incorporates a telephone noise evaluation filter to CCITT P. 53 and is used for measurements in telecommunications.
5. Filter module UPM 550-B 17-5 incorporates an extraneous voltage filter to DIN 45 500 for the frequency range of 31.5 Hz to 15 kHz. As a special feature a special trap (19 kHz) is included to suppress the pilot tone in stereo measurements on FM receivers.
6. Filter module UPM 550-B 17-6 incorporates a bandpass for 1500 Hz intermediate frequency and is thus suitable for selective measurements on this frequency and for distortion measurements on subharmonics on 1500 Hz.
7. Filter module UPM 550-B 17-7 incorporates an extraneous voltage filter to DIN 45 301 for the range from 300 Hz to 15 kHz. A 15.625 kHz trap is fitted to suppress the line frequency in TV receivers.
8. Filter module UPM 550-B 17-8 incorporates a 100 Hz bandpass for selective measurements. The high sensitivity permits coverage also of minimum amounts of 100 Hz mains hum.
9. Filter module UPM 550-B 17-9 incorporates a 1000 Hz distortion factor which takes account of the second to sixteenth harmonics of 1000 Hz and forms an effective barrier to the 1000 Hz base tone.
10. Filter module UPM 550-B 17-10 incorporates a 19 kHz filter for selective measurements, preferably of residual pilot tone in stereo multiplex transmission.
11. Filter module UPM 550-B 17-11 incorporates a 38 kHz filter for selective measurements, preferably for sub-carrier levels in stereo multiplex processing.
12. Filter module UPM 550-B 17-12 incorporates an extraneous voltage filter to DIN 45 301 for the 300 Hz to 15 kHz range with an additional trap for 19 kHz.
13. Filter module UPM 550-B 17-13 incorporates the new circuit noise filter to CCIR 468-1, but with an additional trap for 19 kHz.
14. Filter module UPM 550-B 17-14 incorporates a low-pass to 30 kHz.
15. Filter module UPM 550-B 17-15 incorporates a 330 Hz band pass for selective measurements, for example of subharmonic loudspeaker signals at 1000 Hz excitation.
16. Filter module UPM 550-B 17-16 incorporates a 3000 Hz filter for selective measurements. For example, it is possible to determine selectively the third harmonic in the frequently-used 1000 Hz reference signals.

In deviation from the numbered supplementary modules the filter module UPM 550-B 17-F is not to be mounted on the basic board UPM 550-B 17. It constitutes a compact unit which can be fitted in place of that board, incorporating a frequency deviation meter for measuring the infrared sound transmission. The board is suitable for carrier frequencies of up to 600 kHz. The measurement ranges of 10 kHz and 100 kHz are switched by the two reserve switches on the UPM 550.
Filter board UMP 550-B 17-R is also inserted directly into the UPM 550 without the basic board. The board carries the filter for rumble measurements to DIN 45 539 and the reserve switches are used to switch between circuit noise measurement and extraneous voltage measurement.
Extension board UPM 550-B 100 is available for service purposes.

RVZ 11-1

Impedance meter

ZP 3

Good measuring accuracy.
High operating convenience.
LED display.
6 measuring frequencies.
Impedance measurements from 1 Ohm to 1.99 MOhms.
Powered by internal batteries.

The amount of any impedance can be determined extremely simply with the aid of the ZP 3 impedance meter. The ZP 3 is particularly useful for matching measurements of all types. As the loading of the measured object is extremely small, the ZP 3 is also suitable for measurements on the most sensitive components such as microphones, audio heads, transmitters with highly permeable sheeting etc. Naturally it is possible to use the meter for rapid measurement of resistances, capacitances and inductances. The unit operates on 6 measuring frequencies with appropriate switchings for selection of 63 Hz, 250 Hz, 1 kHz, 4 kHz and 16 kHz. This switching facility enables the user to see quickly whether the imaginary components in the impedance are of a capacitive or inductive nature. With the ZP 3 it is possible to measure impedances between 1 Ohm and 1.99 MOhm, so that virtually every likely impedance in convered. The digital display gives a fast and accurate reading of the measured impedance value. The maximum measuring error is 5 %. An automatic battery output ensures that the power is switched off after 3 minutes if the user forgets to switch off the unit after use. When the battery level falls below a specific threshold the reading "LoBat" will appear additionally in the display sector.
The ZP 3 includes as standard the brown carrying pouch GZT 3-0 and 2 measuring leads with test probes and an alignment chart.

Technical data:

	ZP 3
Measuring frequencies	63 Hz, 250 Hz, 1 kHz, 4 kHz, 8 kHz, 16 kHz
Measuring ranges: resistances and impedances	19.99 Ohms to 1.999 MOhms
Capacitances	5 pF to 2000 µF
Inductances	10 µH to 5000 H
Accuracy	± 5 %
Display	$3^1/_2$-position LCD display
Power supply	2 x 9 V battery/IEC 6 F 22
Current consumption	approx. 25 mA

10 Accessoires

As the leading European specialists in its field, Sennheiser has for many years considered one of its main functions to be the creation and constant expansion and development of a practical accessory range for all of its many products. The Table of Contents on this page alone lists more than 100 accessories which are explained in detail on the following 11 pages.

10 ACCESSOIRES

(Part No. 0533) grey
1414 blue
1415 yellow
1416 green
1417 red

Windscreen and pop filter MZW 30
Oval expanded foam windshield, suitable for transistorised condenser microphones MKH 106, 110, 406 for the range of dynamic microphones MD 211, MD 202, MD 430 and for the range of electret condenser microphone modules ME 20, 40. Maximum diameter at the narrow end is 60 mm.

(Part No. 0534) grey

Windscreen and pop filter MZW 201
The expanded foam windshield MZW 201 fits the range of RF condenser microphones MKH 106, 406, the range of electret condenser microphone modules ME 20, 40 and the studio microphone MD 211. Diameter 18 mm. This windscreen offers more efficient wind damping than the MZW 30.

(Part No. 0535) grey

Windscreen and pop filter MZW 411
The expanded foam windshield MZW 411 is designed for the MD 412 supercardioid directional microphone.

(Part No. 0895) grey

Windscreen and pop filter MZW 415
This expanded foam windshield is designed for the MKH 416 condenser microphone, but also fits on the ME 80. Maximum diameter at the narrow end is 52 mm, length 10 mm.

(Part No. 1422) grey
1425 blue
1135 yellow
1423 green
1424 red

Pop filter MZW 416
Designed for the MD 416 soloist microphone. The pop filter is provided with a plastic ring which locks securely into position when placed over the accoustic inlet guard of the microphone. Diameter 45 mm.

(Part No. 1536) grey
1538 yellow

Windscreen and pop filter MZW 416-1
Also fits the MD 408 microphone. This windshield is recommended for use in outdoor work. Diameter 80 mm.

(Part No. 0976) grey
1641 blue
1440 yellow
1441 green
1439 red

Windscreen and pop filter MZW 441
Expanded foam windshield designed specifically for the MD 441 studio directional microphone. The windshield is to be used ideally if the microphone MD 441 is used in the open air. Maximum diameter 65 mm, length 10 mm.

(Part No. 0536) grey
1527 blue
1528 yellow
1529 green
1530 red

Windscreen and pop filter MZW 421
The expanded foam wind shield for the MD 421 dynamic directional microphone and for the MD 417 and 419 microphones. Ideal for use in the open air.

(Part No 1794) black

MZW 40
This wind shield fits all MD 421 and MD 441 models. It is manufactured of expanded porous foam.

10 ACCESSOIRES

(Part No 1531) grey
1637 blue
1638 yellow
1639 green
1640 red

Windshield MZW 1010
The MZW 1010 windshield and pop filter is designed for the SK 1010/SK 1012 Mikroport transmitters. The windshield is placed on the Mikroport transmitter to permit distortion-free pickup and recording in the open air. Objectionable wind noise is eliminated.

(Part No. 1315) blue

MZW 2002 windshield and pop filter
Expanded foam windshield designed specifically for the MKE 2002 binaural stereo microphone. It is an important accessory for achieving distortion-free recording in the open air, also in close-talking conditions and for dummy head stereo recording. During use it is positioned on the head so that both microphone systems are covered.

MZW 815 (Part No. 0896) grey
MZS 815 (Part No. 0975)
MZP 816 (Part No. 1932)

Windscreen combination MZW 815
This combination is also intended for the shotgun directional microphone MKH 816 in order to avoid recording distortion attributable to handling and wind noises. The various parts in the combination can also be obtained separately. The sprung mounting can also be clamped onto desk top stands and booms for the $^3/_8$" internal thread.

MZW 816 (Part No. 1930)

MZS 816 (Part No. 1931)

MZP 816 (Part No 1932)

Windscreen combination MZW 816
This combination consists of the unbreakable and lightweight MZW 816 windshield cage, the spring mounting MZS 816 and the variable-angle pistol grip MZP 816. The combination is particularly suitable for mobile transmission in the open air and features simple handling and excellent handling noise and wind damping characteristics. The combination can be mounted on a floor stand in place of using it with the pistol grip.

MZW 426 (Part No. 2072)
MZS 416 (Part No. 2071)
MZP 816 (Part No. 1932)

Windscreen combination MZW 426
This combination functions similarly to the MZW 816 combination and is used together with the microphone MKH 816 and the electret microphone and module ME 80.

(Part No 0516)

Desk top stand MZT 12
This desk top stand is fitted with a Tuchel socket T 3005. It accepts dynamic microphones MD 21-2, MD 421-2, MD 430-2 and MD 430-2 T. Dimensions in mm: 168 x 100 x 70. The MZT 12-T desk stop stand is fitted additionally with a button.

(Part No. 0519)

Desk top stand MZT 21
This is designed specifically for the dynamic studio microphone MD 21 N. Dimensions in mm: 102 x 64 x 25. $^3/_8$" thread for the fastening screw clamp.

(Part No. 1945)

Desk top stand MZT 417
A lighweight, low handling noise collapsile plastic desk top stand. The top part unscrews on a $^3/_8$" thread and fits the MKH microphones 106 and 406 and all handling and powering modules in the MKE range.

10 ACCESSORIES

(Part No 0524)

Desk top stand MZT 105-1
Stable desk top stand for studio use, fits all electret condenser microphones MKE 106/406 and 416 and the grip and powering modules in the MKE range.

(Part No 0528)

Desk top stand MZT 421
This fits the studio directional microphones MD 421. Stand dimensions in mm: 127 x 112 x 22. Fastening clamp screw thread: $^3/_8$".

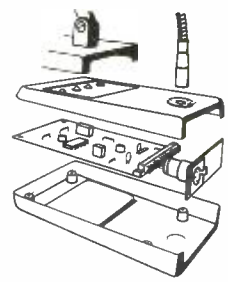
(Part No 0799)

Desk stand MZT 441
Stable and fixed desk top stand for the studio directional microphone MD 441. The desk top stand can also be used with part MZG 415 and MZQ 415 for the microphones MKH 416, 406, 106 and MKH 110. You will find further possible applications in the microphones accessory summaries.

(Part No 1883)

Desk top stand MZT 100
This forms the basis for the stability of a most varied range of microphones. Enclosed in a soft rubber covering for good handling noise damping and attractively styled, at a weight of 1.25 kg this guarantees stable support. A $^3/_8$" thread screw is used for fastening microphones and other attachments.

TSP 400 (Part No 1413)
TSP 400-U (Part No 1374)
TSP 400-U-4 (Part No 1946)

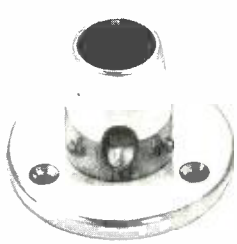


Special desk top stand TSP 400
The basic housing for a desk top speaking station. The two plastic shells form an easily dismantled housing which is used initially to accommodate a PCB (Europa Card Format). Three versions are available: With Cannon plug connector for direct attachment of the MD 418-U; for the use of different microphones with square-shaped aperture and for mounting the articulated joint MZG 415; for use with the microphone MD 418 U-4 (TSP 400-U-4).
A reccessed, unmachined operating panel is provided to accommodate switches, lamps etc. which the user can fit as required. The back is fitted with a removable metal plate for mounting the appropriate socket connectors. Material: impact-proof plastic. Colour: black. Dimensions: 230 x 125 x 42. Weight: approx. 300 g.

(Part No. 0526)

Table clamp MZT 237
This is another way of fastening microphones with $^3/_8$"inside thread to a speaker's podium or desk. Goosenecks or the adapter bar MZS 235 can be fastened to the $^3/_8$"thread. Clamping width 45 mm.

(Part No 0525)

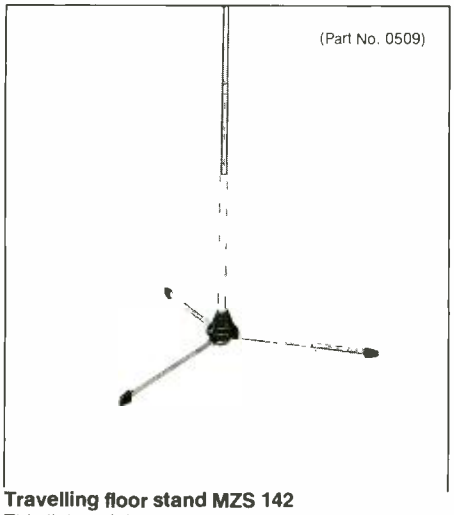


Screw mounted base MZT 141
This pedestal base can be used for fastening gooseneck MZH 141, MZH 142, MZH 21 to a desk or speaker's podium.

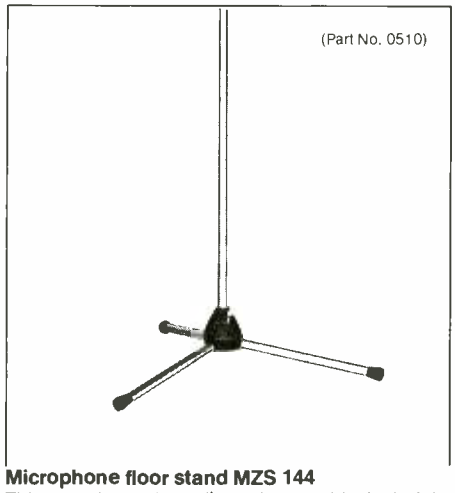
(Part No 1895)

Screw base MZT 14
The screw base is used for fastening goosenecks and stand mountings with $^3/_8$" inside thread onto desk tops.

10 ACCESSOIRES


(Part No. 0509)

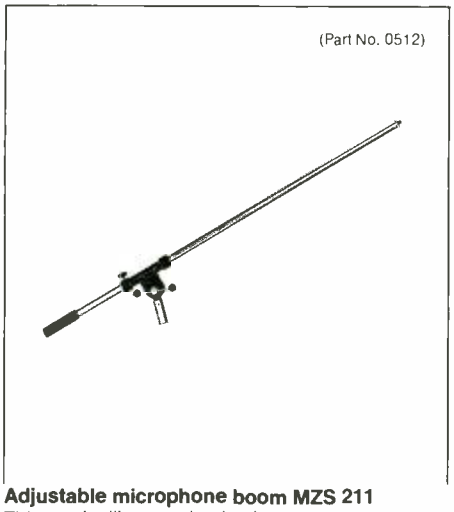
Travelling floor stand MZS 142
This lightweight telescopic stand can be extended up to a length of 138 cm while still retaining a good standard of stability. Collapsed and in a practical carrier it measures only 41 cm. $^3/_8$" thread.


(Part No. 0510)

Microphone floor stand MZS 144
This stand can be adjusted smoothly in height between 84 cm and 158 cm. A built-in tube extension retarder ensures noiseless adjustment. The detachable threaded feet are fitted with rubber tips. $^3/_8$" thread.


(Part No. 0511)

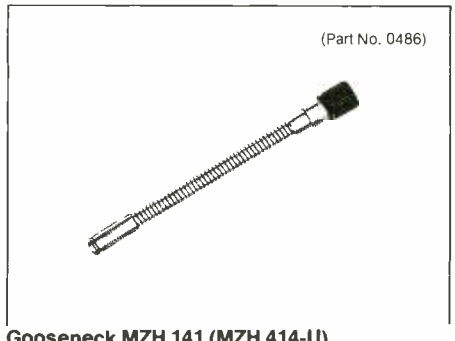
Anti-vibration stand MZS 210
This stand is smoothly adjustable in height between 84 cm and 158 cm. A built-in tube extension retarder ensures noiseless height adjustment. The vibration-damping feet ensure that this rugged floor stand in insensitive to foot-fall sound and floor vibrations.


(Part No. 0512)

Adjustable microphone boom MZS 211
This swivelling and pivoting arm fits on all microphone stands. It is used mainly in studio work and by musicians. $^3/_8$" thread. Length of boom 84 cm.


(Part No. 0483)

Gooseneck MZH 21
The lower connection piece has a $^3/_8$" inside thread and can be screwed onto all microphone and photographic stands. The top connection piece is provided with a $^3/_8$" outside thread. The gooseneck is approx. 200 m long and has a diameter of 15 mm.


(Part No. 0486)

Gooseneck MZH 141 (MZH 414-U)
This is provided with a $^3/_8$" inside thread ready for connection of an internal microphone lead and fits on all Sennheiser stands. Additionally it can be used together with the screw-mounted base MZT 141. The MZH 141 is fitted with a large Tuchel socket connector T 3005 for connecting all microphones with a large Tuchel plug connection (-2).
The MZH 141 U is fitted with a 3-pin Cannon-type connection socket for connecting up all microphones with a Cannon plug connector (-U).


(Part No. 0489)

Gooseneck MZH 142
This practical accessory can be screwed onto all stands with a $^3/_8$" thread. The length of the neck is approx. 200 mm and the diameter 11 mm. The flexible neck is fitted with a 3-pin connector to DIN specifications, e. g. T 3261 1001 and the plug Mas 3 as well as approx. 2 m of 3-core screened lead. It is especially suitable for lightweight microphones.


(Part No. 0513)

Adapter bar MZS 235
With $^3/_8$" inside thread suitable for all microphone stands. This accessory is used mainly in stereo recording work.


(Part No. 0993)

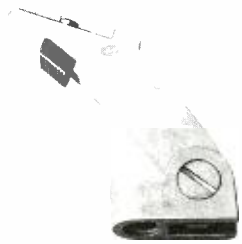
Microphone stand holder MZA 441
Stand holder for microphones in the MD 441 range with interchangeable $^3/_8$", $^5/_8$" and $^1/_2$" threads for use with floor and desk top stands. The MZW 441 stand mounting is attached permanently to a quick-release clamp which clips the microphone into position. Available in black with transparent quick-release clamp.

10 ACCESSORIES

(Part No. 1607)

Microphone stand holder MZA 431
Quick-release clamp and stand holder for the "Profipower", "Profisound" and "Studiosound" microphones. The stand mounting has a $^{3}/_{8}$", $^{5}/_{8}$" and $^{1}/_{2}$" interchangeable thread and is suitable for use with all floor and desk top stands having these threads.

(Part No. 9000)



Microphone stand holder MZA 421
Stand holder for microphones in the MD 421 range with $^{3}/_{8}$" inside thread. Fits on all microphone and photographic stands. Available in grey and black. The microphone or quick-release clamp can be clipped on to the MZA 421 holder.

(Part No. 0977)

Stand holder MZQ 421
This practical accessory, available only in grey, is suitable for all MD 421 models and particularly useful for stage performers and soloists who need to be able to take the microphone quickly and reliably from the stand. The quick-release holder is connected with the adapter of the microphone MD 421 and can thus be screwed onto all floor stands, booms and desk stands with a $^{3}/_{8}$" thread.

(Part No. 0475)

Microphone stand holder MZA 415
Quick-release clamp and stand holder for the soloist microphones MD 416 N and MD 416 U. The stand holder has $^{3}/_{8}$", $^{5}/_{8}$" and $^{1}/_{2}$" interchangeable threads and is suitable for use with all floor and desk top stands having these thread sizers.

MZS 415 (Part No. 0938)
black (Part No. 1956)

MZQ 415 (Part No. 0944)

MZG 415 (Part No. 0943)
black (Part No. 1955)

MZT 441 (Part No. 0799)

Desk top combination
For all microphones with 19 mm housing diameter (e.g. MKH/MKE). The individual parts are available separately.

(Part No. 1167)

Microphone clamp MZA 406
This microphone clamp is able to accomodate all microphones up to a diameter of 30 mm. It is particularly suitable for soloists and stage performere who need to use different shapes and sizes of microphones. It has a $^{3}/_{8}$" inside thread for mounting on all stands and booms.

(Part No. 0964)

Microphone clamp MZA 211
For fastening the MD 211 on a stand. A quick-release clip is particularly useful for speakers and soloists who need to remove the microphone quickly and sefely from the stand. Available in black.

(Part No. 0751)

Stand holder SZS 1010
This accessory is designed for fastening the Mikroport transmitters SK 1010 and SK 1012 on a floor or desk top stand. The clamp holder can be screwed onto all conventional stands with the aid of the $^{3}/_{8}$" inside thread.

(Part No. 1185)

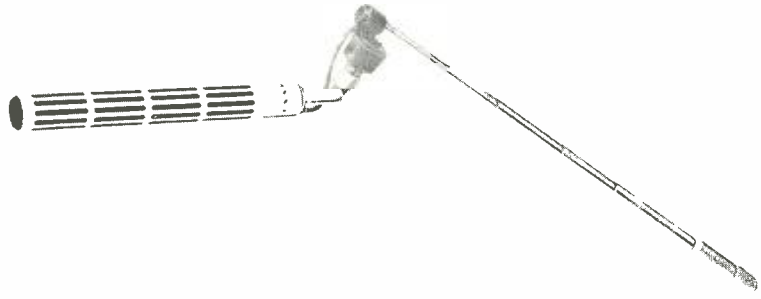
Lavalier carrier SZU 1008
The SZU 1008 Lavalier carrier is used for keeping the Mikroport transmitters SK 1010 and SK 1012 with clip-on microphones always at the correct talking distance from the mouth of the speaker. This prevents clothing rustle noise which would otherwise be generated very easily by the transmitter microphone rubbing against the wearer's clothing.

10 ACCESSORIES

(Part No 1501)

Camera microphone mount MZG 802
This is for mounting the telemike system on cameras provided with a $^{1}/_{4}$" inside thread. With the MZG 802 the microphone can be angled smoothly and also swivelled about a 90° arc.

(Part No. 1443)



Special purpose telescopic boom MZS 802
This special telescopic boom for film and video cameras has been developed for use with the Sennheiser electret condenser microphones (modular technology). The double telescope can be extended from approx. 28 cm to 68 cm. It links the microphone modules with the grip and powering module. It is fastened on the cameras with the aid of the MZG 802 mount.

(Part No. 0972)

Microphone Bracket MZB 415
The fibreglass microphone bracket can be extended from 1000 mm to a length of 3400 mm. Shorter length can also be achieved by removing one or more tubular telescopic sections. The angle is adjustable on the mechanical part for mounting the microphone. All microphone holders with a $^{3}/_{8}$" inside thread will fit. The pickup direction of the microphone can be varied by 360° by swivelling the bracket rod. The bracket weighs only 640 g.

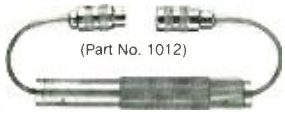
MZ 802 (Part No. 1532)
MZ 802-U (Part No. 1533)

100 Hz filters MZF 802 and MZF 802-U
The 100 Hz MZF 802 filter drops bass level by about 12 dB per octave below 100 Hz and can be used to reduce wind and handling noises. The filter is interposed in the connecting lead between the microphone and amplifier input. When powered from phantom mains units it must be coupled between the mains unit and amplifier. MZF 802 with 3-pin screw-type standard plug connector. MZF 802-U with 3-pin Cannon-type plug coupling.

MZF 15 (Part No. 0478)
MZF 15-U (Part No. 0479)

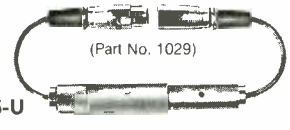
Roll-off filters MZF 15 and MZF 15-U
For lowering bass level by about 6 dB at 50 Hz and about ≧ 15 dB at 25 Hz. It is interposed in the connecting lead between supply voltage source and amplifier input when used with capacitor microphones. This is the filter for all RF condenser microphones from Sennheiser with AB powering to DIN 45595 and phantom powering to DIN 45596. The MZF 15-U is fitted with Cannon-type plug connectors. When the filter is used on low-impedance symmetrical dynamic microphones the bass reduction becomes effective from 200 Hz.

(Part No. 1012)



MZA 15

(Part No. 1029)



MZA 15-U

Battery adapter MZA 15 (MZA 15-U)
As a power supply for the RF condenser microphones in the 6 T/6 TU series, the battery adapter is coupled at any point in the microphone lead. It is powered by 9 Mallory RM 625 mercury cells which give an operating time of 50 to 60 hours (LED battery level indicator).
MZA 15 (with 3-pin screw-type standard plug connector).
MZA 15-U (with 3-pin Cannon-type plug connector).

(Part No 1545)

MZA 10 N

MZA 10 (Part No. 1420)
MZA 10 U (Part No. 1546)

Battery adapter MZA 10/MZA 10 N/MZA 10 U
Power supply for the clip-on microphones MKE 10 and MKE 40. The MZA 10 has an assymmetric output at medium impedance for M-inputs where as the MZA 10 N low-impedance, symmetrical, output for M-inputs. These are fitted with a screw-type 3-pin small Tuchel built-in plug connector. MZA 10 U as MZA 10 N, but with Cannon-type connector plug.
Technical data see pages 46/47.

MS 10 P (Part No 1826)
MS 10 P-U (Part No. 1786)
MS 10 T (Part No. 1827)
MS 10 T-U (Part No. 1785)

MZA 5

Powering adapter MS 10
For powering the clip-on microphones MKE 10 and MKE 40 and the K 30 AV. AB powering. MS 10 T and MS 10 T-U. 12 V supply. Phantom powering: MS 10 P and MS 10 P-U. Voltage 12 to 48 V. Plug connector versions: MS 10 T-U/MS 10 P-U, Cannon system, MS 10 T/MS 10 P, screw type 3-pin small Tuchel built-in plug connector.

10 ACCESSORIES

KAT-2 (Part No. 0942)
KAT-3 (Part No. 1063)

Transistorised amplifier KAT 15-2 and KAT 15-3
This amplifier is for connection of the AB powered condenser microphones and for symmetrical low impedance dynamic microphones to the line or accessory inputs of the NAGRA III and NAGRA IV auxiliary broadcasting tape recorder. The operating mode is switch-selected (T = capacitor microphones, N = dynamic microphones). A switchable bass cut filter is fitted. Dimensions in mm: 85 x 40 x 25. KAT 15-3 model with Cannon plug connector.

(Part No. 0809)

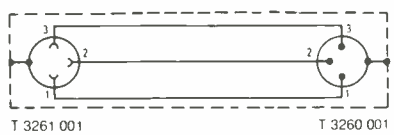
Microphone preamp VV 200 T
This is for the dynamic microphones. Amplification is 20 dB, output impedance around 20 Ohms. Connection is by a large 3-pin Tuchel coupling T 3080002 to a 1.5 m lead. The input is symmetrical and floating. Powering is via the output lead to DIN 45595 for sound via powering. The amplifier incorporates a switchable basscut filter. Dimensions in mm: 85 x 40 x 25.

MZN 16 P (Part No. 1240)
MZN 16 P 48-U (Part No. 1241)

Mains unit MZN 16 P 48 and MZN 16 P 48-U
Power supply unit for 48 V phantom powering to DIN 45596. The mains unit MZN 16 P 48 is for condenser microphones in the MKH-P 48 series. The MZN 16 P 48-U is fitted with a Cannon plug for the MKH-P 48 -U microphone. Two microphones can be connected simultaneously to both units. Dimensions: 168 x 120 x 50 mm.

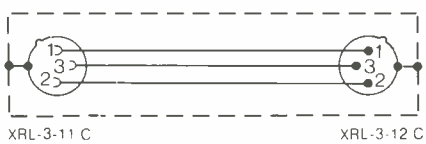
MZN 16 T (Part No. 1236)
MZN 16 T-U (Part No. 1237)

Mains unit MZN 16 T and MZN 16 T-U
Power supply unit for 12 V AB powering to DIN 45595. The MZN 16 T connections are for the series MKH-6 T condenser microphones. The MZN 16 T-U is fitted with a Cannon plug for microphones in the series MKH-6-T-U. Both units can accommodate 2 microphones simultaneously. Dimensions: 168 x 120 x 50 mm.



KA 1 (Part No. 0255)
KA 7 (Part No. 0256)

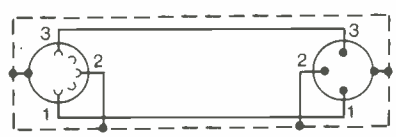
Connecting lead KA 1 and KA 7
Both leads are suitable for general use. They differ only in length (KA 1 = 1.5 m, KA 7 = 7.5 m). They carry a 3-pin standardised plug connector to DIN 41524, e. g. T 3260001 and an appropriate coupling, e. g. T 3261001.



Connecting lead KA 7-U
This lead is for connecting all Sennheiser microphones with a code designation terminating in "U". The lead carries a Cannon coupling connector at one end and a Cannon plug connector at the other. The lead is 7.5 m in length.

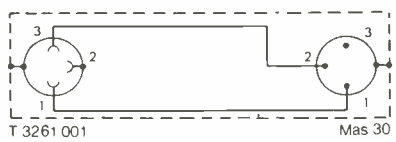
(Part No. 0023)

Connecting lead DA 1 HL
For all moving coil microphones with 3-pin standard plug connector to DIN 41524 specifications. 1.5 m in length. The 3-core screen lead carries a 3-pin standard coupling connector to DIN 41524, e. g. T 3261001 on one end and an appropriate plug connector, e. g. MAS 30, at the other.



(Part No 0024)

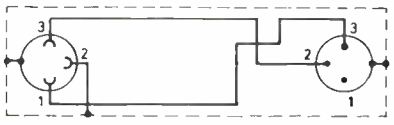
Connecting lead DA 7 N
The DA 7 N is for all low-impedance dynamic microphones with 3-pin standard plug connector to DIN 41524, 7.5 m in length. The 2-core screened lead carries an appropriate coupling connector, e. g. T 3261001 and a standard plug connector, e. g. Mas 30 at the other (see circuit diagram).



(Part No. 0890)

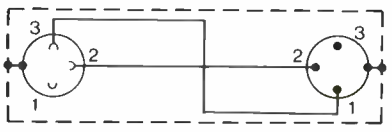
Connecting lead DA 7 NM
This lead is for connecting symmetrical low-impedance microphones to medium impedance inputs. 7.5 m in length and 2-core sreened. It carries a standard plug connector to DIN 41524, e. g. Mas 30, on one end and an appropriate coupling connector, e. g. T 3261001 at the other.

10 ACCESSORIES



(Part No. 0025)

Connecting lead DA 7 NL
Connects symmetrically wired low-impedance microphones with 3-pin standard plug connector to DIN 41 524 which are connected to asymmetrical low-impedance (L) inputs with 7.5 m lead. The 2-core screened lead is fitted with a standard coupling connector to DIN 41 524, e. g. T 326 1001 on one end and a plug connector, e. g. Mas 30, on the other.

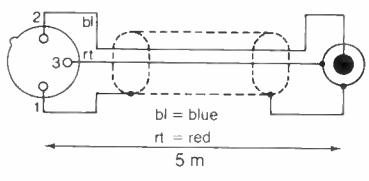


(Part No. 0891)

Connecting lead DA 7 LM
For connection of low-impedance asymmetric microphone with standard plug connector to DIN 41 524 to medium impedance inputs. The lead is 2-core, screened and 7.5 m in length. Plug couplings to DIN 41 524, e. g. Mas 30 and coupling connector T 326 1001.

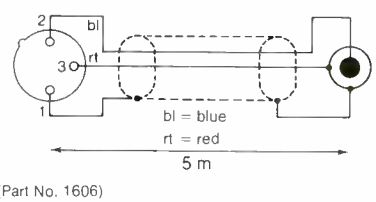
(Part No. 1496)

Connecting lead DA 7 NK
This lead is for connecting symmetric low-impedance microphones to low and medium impedance inputs. It is 2-core, screened and 7.5 m in length. It carries a 2-pin 6.3 mm jack connector and a DIN coupling connector, e. g. T 326 1001.



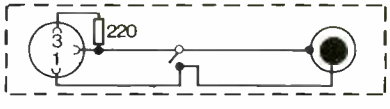
(Part No. 1627)

Connecting lead DA 5 UK
Connecting lead with Cannon coupling connector and 6.3 mm jack connector for low and medium-impedance inputs. Suitable for all Sennheiser microphones terminating in "U". Lead length 5 m.



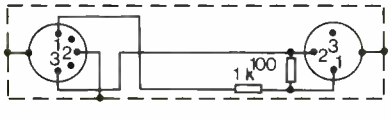
(Part No. 1606)

Connecting lead MZK 431 UK
This lead is fitted with a Cannon Switchcraft coupling connector. 5 m in length. A 6.3 mm jack connector is fitted for the unit input and this is particularly suitable for the "Profipower", "Profisound" and "Studiosound" microphones.



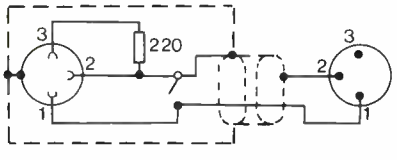
(Part No. 1296) jack-type connector 6.3 diameter

Connecting lead DA 5 NK-T
The single-core screened 5 m lead is for connecting symmetric low-impedance microphones to low and medium-impedance inputs. A switch is incorporated in the 3-pin screw-type microphone coupling connector (contact wired to DIN 41 524).



(Part No. 0996)

Connecting lead MA 5 NM
For connecting the Mikroport receivers EM 1001, EM 1003, EM 1010, EM 1012 and EM 1026 to musician's amplifier inputs. An output socket is used for the receiver connection. The lead is connected to the musician's amplifier at the 3-pin microphone input or in conjunctin with MZA 12 to the 6.3 mm jack connector socket.



(Part No. 0960) Mas 30

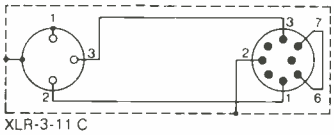
Connecting lead DA 5 NM-T
The range of applications is similar to the DA 5 NK T. A switch is incorporated in the 3-pin screw-type microphone coupling connector (contact wired to DIN 41 524). A 3-pin coupling plug to DIN 41 524 (Mas 30) plugs into the unit.

MZK 802 (Part No. 1503)
MZK 802-1 (Part No. 1574)
MZK 802-U (Part No. 1573)

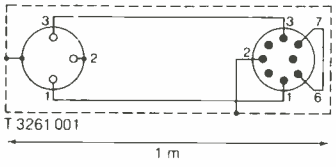
Connecting lead MZK 802 and MZK 802-1
These leads connect the MKE series powering modules to sound film cameras with 3.5 mm jack connector socket or 3-pin Mas 30 connector plugs (MZK 802-1) as microphone input. The MZK 802-U is for powering modules fitted with Cannon plug connectors. The short coiled lead can be extended to 1 m in length.

10 ACCESSORIES

DA 1012 U (Part No. 2062)



DA 1012 N (Part No. 1957)



Connecting lead DA 1012 N and DA 1012 U
For connecting low-impedance symetrically wired microphones to the Mikroport transmitter SK 1010 and SK 1012. The lead DA 1012 N is fitted at the microphone end with a screw-type coupling connector and at the unit end with a screw-type 8-pin plug connector. The DA 1012 U carries a Cannon coupling connector.

(Part No. 1944)

Connecting lead MZK 30 AV
Sprcially for connection of the powering module K 30 AV to input with the voltage supply to centre contact pin to DIN 45326.

(Part No. 0026)

Connection and extension lead DAV 5
The connection and extension lead is suitable for all dynamic microphones with large 3-pin Tuchel plugs. Length 5 m. The 3-core screened lead carries the coupling connector T 3080002 at one end and plug T 3079002 at the other (see circuit diagram).

(Part No. 1421)

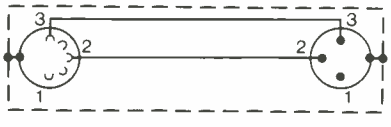
Special extension lead MZV 10
This 7.5 m extension lead is for the Sennheiser MKE 10 and MKE electret capacitor clip-on microphones. The circuit, compact layout and plug-type comply with DIN 45326 specifications.

(Part No. 0032)

Extension lead DV 7 N
Extension for low-impedance microphones with 3-pin standard plug connector to DIN 41524. The 7.5 m lead is of the 2-core screened type and carries a standard plug connector to DIN 41524, e. g. Mas 30 and an appropriate coupling connector, e. g. Mak 30 S.

(Part No. 0031)

Extension lead DV 7 M
Extension lead for medium-impedance microphones with 3-pin standard plug connector to DIN 41524 to medium-impedance input. The lead is 7.5 m in length and of the 2-core screened type. Plug connectores to DIN 41524, e. g. plug Mas 30 and coupling connector Mak 30 S.

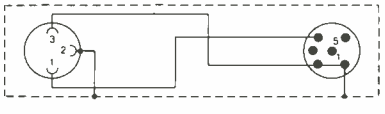


(Part No. 0030)

Extension lead DV 7 HL
This is for HL microphones or LM microphones with 3-pin standard plug connectors to DIN 41524 and which have to be operated asymmetrically with low impedance. The lead is 7.5 m in length and of the 2-core screened type. It carries a plug connector to DIN 41524, e. g. Mas 30 and an appropriate coupling connector, Mak 30 S.

(Part No. 0531)

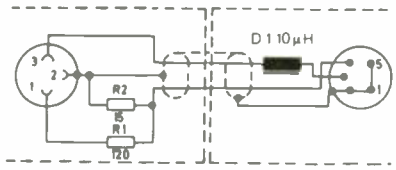
Extension lead MZV 125
The 60 Ohm coaxial lead is 5 m in length and is used as an extension between microphone units MK 12 and the RF unit MKH 124 or MKH 125. The lead is flexible and fitted with a "LEMO" plug and coupling connector.



(Part No. 1007)

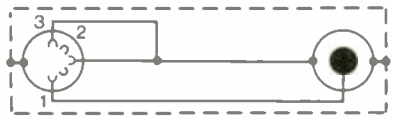
Connection lead DA 1 NY
Connection lead for all low-impedance dynamic microphones to the Mikroport transmitters SK 1005, 1006, 1007 and 1008. The lead is of the 2-core screened type and carries a screw-type coupling connector T 3261001 at the microphone end and a screw-type connector plug T 3400001 at the unit end.

10 ACCESSORIES



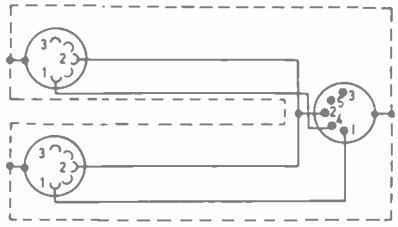
(Part No 0935)

Connection lead KAM 1-5
Connection lead for condenser microphones in the 6 T series to Mikroport transmitters SK 1005, 1006, 1007 and 1008 and to the auxiliary broadcast transmitter SER 1. The 1 m lead serves as an antenna for Mikroport transmitters without a separate antenna. It is fitted at the microphone end with a screw-type coupling socket T 3260001 at the unit end with a plug connector T 3360-001.



(Part No 0959)

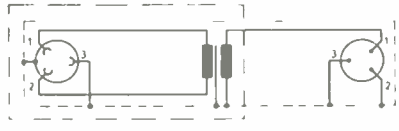
Adapter jack MZA 12
This jack is for connecting low and medium-impedance microphone leads to 6.3 mm jack-type connector sockets.



(Part No 0497)

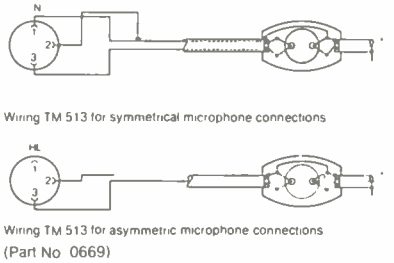
Connection lead MZK 12
The connector is for 2 high or medium-impedance asymmetric microphone to a 5-pin stereo unit input. At the unit end it carries a 5-pin standard Mas 50 S plug and at the microphone end 2 Mak 30 S standard couplings. The lead is 150 mm in length and of the 2-core screened type.

Headphone distributor lead HZK 414-17 (30-fold) and HZA 414-17-1 (10-fold)
Suitable for high-impedance headphones with standard headphone plug connector to DIN 45327. At the amplifier end the lead carries standard loudspeaker plugs. These plugs can be coupled in series to produce monaural sound or both channels can be used for 2 different programmes running simultaneously. Total length 30-fold = 36.5 m, 10-fold = 15 m. Spacing between sockets: 1 m.



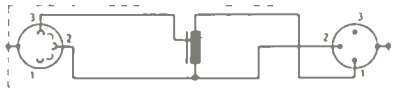
(Part No 0620)

Lead transformer TB 501
This is one of our popular top-of-the-range wideband transformers. The microphone end carries a 3-pin Tuchel socket T 3080002, at the other end a plug T 3079002 on the 0.75 m screened lead. Socket wiring: 1 and 2 to moving coil, 3 and socket housing to screening. Plug wiring: 1 to live (grid), 2 and 3 to earth. Ratio 1 : 20. Source impedance 200 Ohm.



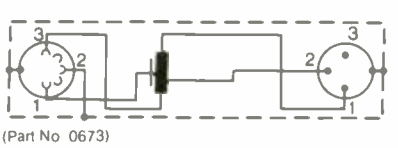
(Part No 0669)

Lead transformer TM 513
Universal transformer which can be fitted with any desired plug connectors and microphone cords. An 0.5 m long single-core screened lead plugs into the equipment. Ratio 1 : 20, source resistance 200 Ohm. The above diagram shows how the TM 513 symmetrical or asymmetrical connections can be matched.



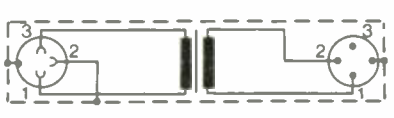
(Part No 0672)

Lead transformer TM 514 HL
This is for connecting HL microphones to high-impedance inputs. Coupling wiring: 3 and 2 to moving coil, housing to screening, plug connection: 1 to live (grid), 2 to earth, plug housing to screening. Transformation ratio 1 : 16.



(Part No 0673)

Lead transformer TM 514 N
For connecting symmetrically wired low-impedance (200 Ohm) microphones to high-impedance inputs. The microphone end is fitted with a 3-pin standard coupling connector and 5 m of screened extension lead and the equipment end carries 0.4 m of screened lead and a 3-pin standard plug (Mas 30). Socket wiring: 1 and 3 to moving coil, 2 and socket housing to screening. Plug wiring: 1 to live (grid), 2 to earth, plug housing to screening. Transformation ratio 1 : 16.



(Part No 0675)

Lead transformer TM 514 X
Symmetrically wired low-impedance 200 Ohm microphones can be connected to medium-impedance inputs. The microphone end carries a 3-pin screw-type coupling socket to DIN 41624 (T 3261/1) and 5 m of screened extension lead; the equipment end carries 0.4 m of sreened lead and a 3-pin standard plug (Mas 30). Socket wiring: 1 + 3 to moving coil, 2 + socket housing to screening. Plug wiring: 1 to live, 2 to neutral, plug housing to screening. Transformation ratio 1 : 5.

10 ACCESSORIES

(Part No. 0856)

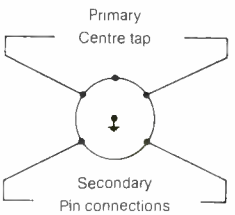
Plug transformer TS 514 M
This is incorporated in the equipment plug and intended to connect LM microphones to high-impedance inputs. Transformation ratio 1 : 6. The screened 5 m long lead is fitted with a 3-pin coupling connector to DIN 41 524, e. g. Mak 30 S. Wiring: 1 + 2 to moving coil = medium-impedance asymmetric, 3 + 2 to moving coil = low-impedance asymmetric, 3 bridget with 1. Connector shell to screen. Plug wiring: 1 to live, high-impedance, 2 to neutral and 3 to live, low-impedance.

TMB 103, 1 : 15, Bv 1,2-148 (Part No. 0772)
TMB 103, 1 : 25, Bv 1,2-236 (Part No. 0685)
TMB 103, 10 : 1, Bv 2,1-124 (Part No. 0678)

Wire colours
primary: . . . grey, green
secondary: . . . blue (neutral)
red (live)

Input transformer TMB 103
The TMB 103 broadband miniature transformer is manufactured with a Mu-metal shield for mounting above the chassis. Transformation ratio 1 : 15 or 1 : 25. Frequency response 30 to 20,000 Hz for source resistances of 200 Ohm. The transformer No. 0678 is specially for tape recording of TV sound on ac/dc equipment.

TB 432, 1 : 15 Bv 1,2-01 (Part No. 0619)
TB 432, 1 : 30 Bv 1,2-23 (Part No. 0618)



Input transformer TB 432
The TB 432 wideband transformer is manufactured of Mu-metal and copper-screened for chassis mounting. Transformation ratio 1 : 15 or 1 : 30, frequency response 25 to 20,000 Hz, for source impedances of 200 Ohm.

TM 003, 1 . 15, Bv 1.1-0,8 (Part No. 0649)
TM 003, 1 30, Bv 1.1-05 (Part No. 0650)

Wire colours
Primary: . grey, green
Secondary . blue (earth)
red (grid)

Input transformer TM 003
The TM 003 miniature transformer is Mu-metal screened for chassis mounting. In the transformation ratio of 1 : 15 the frequency response extends from 50 to 20,000 Hz, in a ratio of 1 : 30 the frequency response extends from 80 to 20,000 Hz. For source resistances of 200 Ohm.

TM 003, 1 : 5 : 2.5 Bv 1.1-400 (Part No. 1032)
TM 003, 1 : 1 Bv 1.1-406 (Part No. 1377)

Input transformer TM 003
These miniature transformers are Mu-metal screened for chassis mounting. Bv 1.1 to 400 with 2 transformation ratios of 1 : 5 and 1 : 25. It is intended for source impedances of 200 Ohm or 700 Ohm. Bv 1.1 to 406 transformation ratio 1 : 1, source impedance 200 Ohm. The frequency response of both input transformers are 30 to 20,000 Hz.

(Part No. 1203) straight stereo jack connector diameter 6.35	**HZR 26-13**	overall length 3 m
(Part No 1204) Short stacking plug DIN 45 327	**HZR 26-17**	overall length 3 m
(Part No 1783) straight stereo jack connector diameter 6.35	**HZR 26-33**	overall length 6 m
(Part No 2073) Short stacking plug DIN 41 529 with PX 1	**HZR 26 PX**	overall length 6 m
(Part No 1202) 2 loudspeaker stacking plugs DIN 41 529	**HZR 26-4**	overall length 3 m

HZR 26 Stereo control
The HZR 26 stereo control is a connecting lead for stereo headphones with control box for separate volume control on the right and left channels. The space between headphone and control box is 77 cm.

(Part No. 0208)

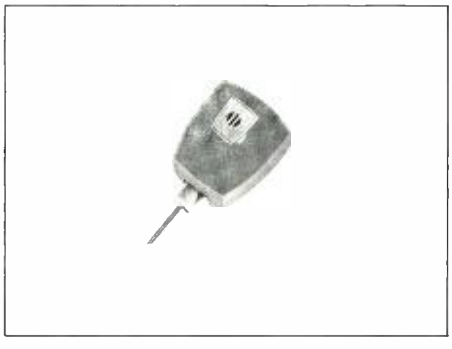
HZA 414 Terminal box for headphones
Pop groups wishing to experience the sound of their music jointly by headphones choose the HZA terminal box for their headphones. The HZA also permits simultaneous reproduction by loudspeakers. The following facilities are provided: loudspeaker only, loudspeaker and headphones, headphones only.

11 INDUSTRIAL RANGE

Sennheiser electronic manufactures in its industrial range more than twice as many products as those described in this publication. This industrial range is marketed by prominent West German and foreign electronic enginnering firms. In close collaboration with these customers new industrial products are being developed to customer specifications in our ultra-modern development laboratories. Below are several typical products in this range.
Understandably production of all of these products depends on the quantity ordered and small-scale production is not economically viable.

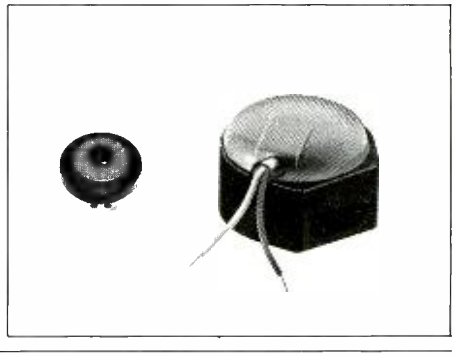
Magnetic Clip-on Microphone MM 28

This small magnetic clip-on microphone in the form of a buttonhole microphone for speech transmission is manufactured for special fields of application. A standard version is available with an impedance of 200 Ohm, so that it can be connected to transistoried equipment without additional transformers (other impedances on request).
Plug-in connection lead HZL 18 in standard length of 1500 mm.



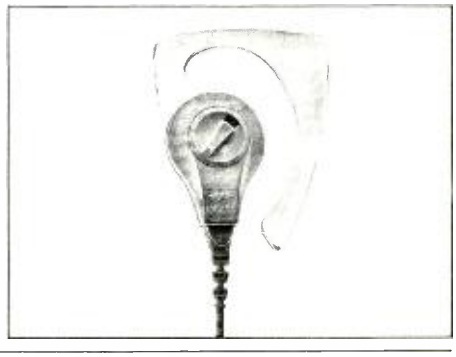
Magnetic Miniature Earphone

A range of miniature magnetic earphones is available, especially for use in stethosets or earclips for dictation transcription purposes. These differ mainly in the various impedance for matching the large number of dictation machines on the market. These miniature earphones fulfill requirements for economically priced miniature phones offering high intelligibility. At the same time their construction and use of the magnetic system renders them extremely rugged and durable. Miniature earphone types are available fitted with a special resonator for use as signal transmitters, for example in paging systems. The transducers can also be supplied without resonator for special applications.



Dynamic Transcription Earphones HD 405

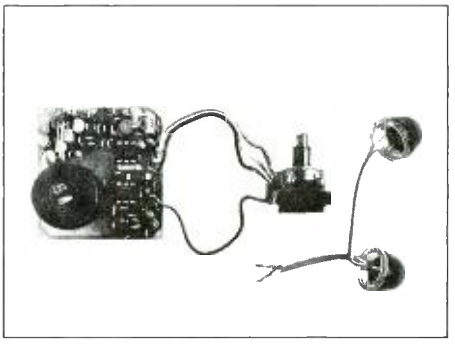
This dynamic miniature earphone brings the improved tonal quality produced by modern dictation equipment clearly through to the ear of the listener. By comparison with previous magnetic miniature earphones this dynamic model offers a wide and flat frequency response without any resonant interference in the response range. The open earphone system permits it to be worn either with an earbow for one ear or a stethoset for both ears. The accenting of lower frequencies resulting from use of a stethoscope can be balanced with a base tuner. The miniature earphone are available with impedances of 17 Ohm, 70 Ohm and 200 Ohm.
Plug-in connecting lead HZL 18 in standard length of 1500 mm.



11 INDUSTRIAL RANGE

Infrared Receiver Module for Ear Protectors

With this 3-piece assembly kit, consisting af 2 complete PCBs with acoustic transducers and a receiver diode, Sennheiser offers a possibility for equipping ear protectors with an infrared receiver. The receiver is thus suitable for the reception of monaural infrared signals on the standard carrier frequency of 95 kHz. Suitable transmitters are the
SI 406 (for room areas up to 20 m^2)
SI 1011 with an optional number of emitters
SZI 1011 (for any size of room).



Mechanical Dictation Microphones

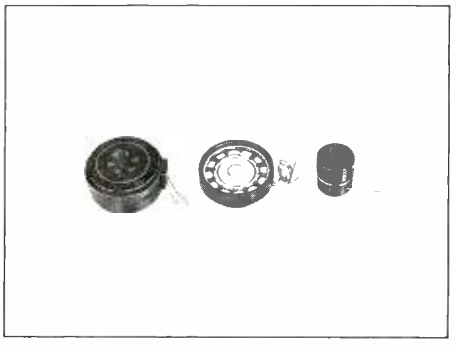
Sennheiser electronic has held a leading position in this field for over 25 years. In close collaboration with the leading manufacturers fo dictating equipment throughout the world, new and technically improved dictation microphones are constantly being developed to user specifications which today occupy a leading position in the market both mechanically and acoustically. Virtually all well-known dictation machines on the market today are equipped with these dictation microphones.

Electronic Dictation Machines

Full electronic control is the latest development in the field of dictation microphones. A simple electronic touch switch now replaces the mechanically operated parts of the 4-stage switch, previously susceptible to malfunctions. Particularly high quality and ergonomic dictation equipment is today equipped with these microphones. These fully electronic dictation microphones also display the familiar high quality Sennheiser features such as excellent transmission characteristics in recording and playback as well as reliable operation even in rugged use.

Dynamic Transducing Modules

Sennheiser supplies very large quantities of high-quality dynamic transducer systems for recording and playback. These transducers are distinguished not only for their carefully selected frequency responses but also by their high efficiency at lowest volume levels. Additionally they are reliable, rugged and in sensitive to handling noise. Owing to the excellent characteristics of these dynamic transducing modules they are to be found in an extremely wide range of different equipment on the market today.



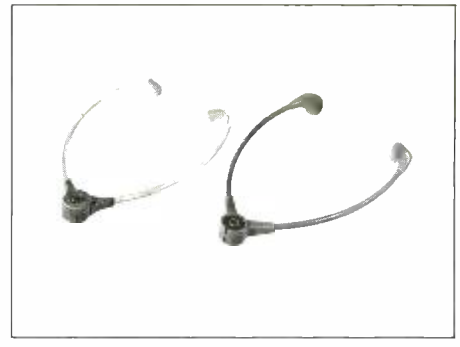
11 INDUSTRIAL RANGE

PA Microphones for Stationary and Mobile Equipment

These microphones are available especially for paging and cueing systems and for installation in motor vehicles. In accordance with their intended use, they are particularly well protected against acoustic feedback and can be used in noisy environments. They are also extremely reliable and rugged.

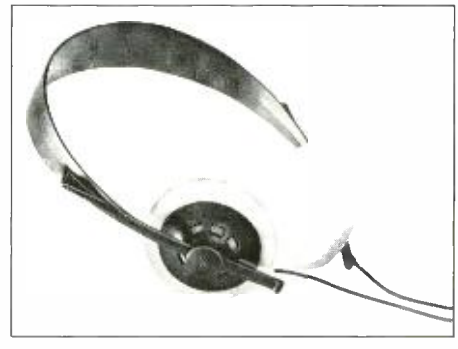
Stetoclip HZS 1 and HZS 3

The stetoclip HZS 1 is a widely used design with a swivelling fork joint. A miniature magnetic earphone type HM 21 or HM 35 clips into a hole in the centre of the joint. However, the dynamic dictation headphone can also be used with the Stethoclip HZS 3 which uses resilient tubing for wearing comfort without requiring any adjustment.



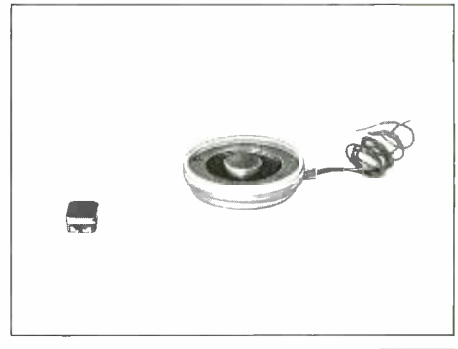
Dynamic Stereo Headphone HD 400

Sennheiser electronic supplies the well-known stereo headphone HD 400 in special version to a number of prominent airlines for use in the cockpit and first-class cabin.



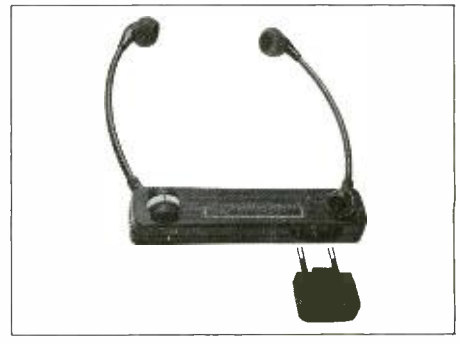
Magnetic Vibration Pickup Module

The KM 401 vibration pickup in the speech frequency range is used mainly as a throat microphone. It is rectangular in shape and its dimensions of 7.15 x 10 x 4.2 mm render it particularly suitable for incorporating in other equipment. It operates on the magnetic principle with a resonance frequency of around 1650 Hz. The MM 13-3 model also operates on the magnetic principle with a resonance frequency in the range of 500 to 600 Hz. It is used for special ground noise investigation as well as for other work involving main components approx. within this frequency range. Matching impedance is available on request.



Wireless Infrared Headphone HDI 406

Lightweight dynamic stetoclip-type headphone for wireless, monaural sound reception using infrared light as a carrier. The receiver and driver are accommodated in a small housing to form one unit with the headphone. This unit is powered by a plug-in rechargeable battery with integral charger. At the end of broadcasting this powering unit can simply be pulled off and inserted in the nearest mains socket. Together with an infrared transmitter this provides high quality sound transmission by wireless in a design which is highly popular for use in the transmission of TV sound.

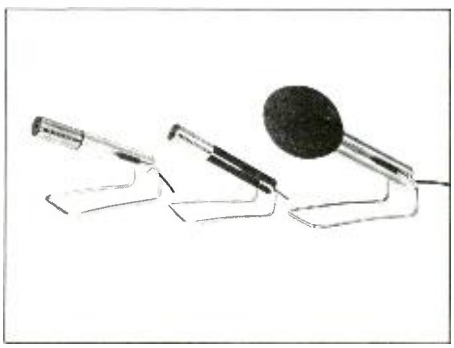


Microphone Capsules for Sound Level Meters and Noise Dosimeters

High quality capacitive transducer utilising the back-electret technique. Built-in integrated circuit. On request we can adapt this to specific customer requirements.

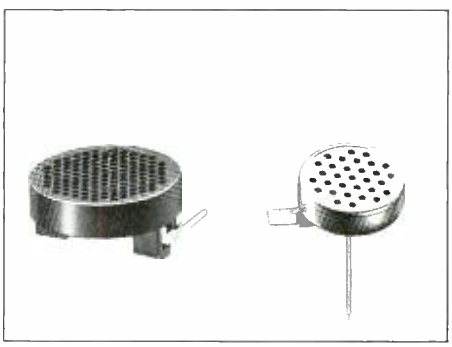
Microphones for Tape Recorder Standard Equipment

Sennheiser supplies microphones for tape recorders with the normal Sennheiser quality throughout the world. This includes simple stand-mounted microphones with cardioid or super-cardioid directional characteristics, hand microphones with extremely low handling noise characteristics through to microphones with automatic gain control for a wide range of applications.



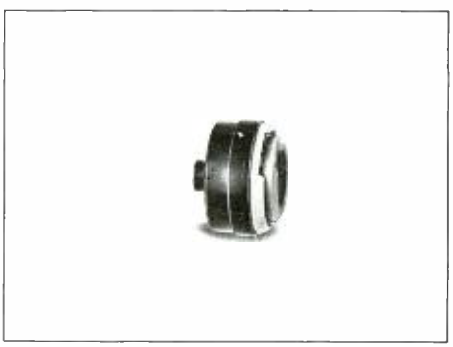
Ultrasonic transmitter and Receiver Capsules

Capacitive transducers for airborne sound, suitable for use as transmitters or receivers in the ultrasonic range up to 45 kHz. For transmission and control purposes.
Two basic models of identical appearance are supplied for different application.
KU 15-N transmitter capsule for low operating voltage.
KU 11-E-40 receiver capsule for an electret condenser receiver requiring no external bias.



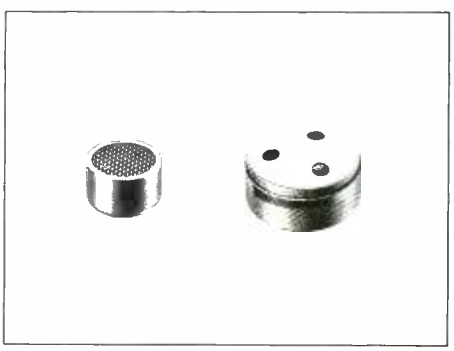
Acoustic Emitter for Electronic Buzzer Alarm HM 26-4

Compared to the usual buzzers or bells this new electro-acoustic alarm is a noteworthy technical innovation. The electronic acoustic emitter can be used for alarm clocks, paging systems, freezer systems and acoustic equipment where an acoustic signal is required which must be sufficiently loud without being unpleasantly obtrusive and must at the same time be clearly distinguishable from other surrounding noises, for example also in motor vehicles. An external circuit delivers the rhythmic intermittent tone at 1850 Hz approx. 60 dB. Dimensions: 17.6 mm diameter x 10 mm.



Electret Condenser Microphone Module

These small high quality microphone modules are ideal for installation in tape recorders, cassette recorders, dictation units and intercom systems. They display all the advantages of condenser microphones such as high sensitivity, superlative transmission characteristics and insensitivity to magnetic interference. Additional advantages are the extremely low handling noise sensitivity, the simple connections and low power consumption at low voltage.



Sennheiser Representations

OVERSEAS

Argentina
S.E.M.A.U. S.A.,
Att: Ing. Koisser, Edison 440,
1638 Vincente Lopez,
Pca. Buenos Aires,
✆ 795-2086,
Tx 18057 rygsa ar

Australia
R. H. Cunningham Pty. Ltd.,
P.O. Box 4533,
Melbourne, Vic. 3001,
146 Roden Street,
West Melbourne, Vic. 3003,
✆ 329 9633,
Tx 31447 cunning aa

Brazil
EUROBRAS Ltda.,
C. Postal 622-ZC-00,
Graca Aranha 19-Gr. 401,
Rio de Janeiro,
✆ 240-3399,
Tx 2123001 efpc br

Canada
TC Electronics (Canada) Ltd.,
2142 Trans Canada Highway,
Dorval, Quebec H9P 2N4,
✆ (514) 683-7161,
Tx 5822847 tciseelmtl

Chile
Tevelectric Ltda.,
Casilla 10493,
Santiago de Chile,
✆ 229006,
Tx 40596 tevel cl

Columbia
Wilhelm Puth,
Pan American Company,
P.O. Box 14472, Bogotá,
✆ 2586817
Tx 43326 camc co "for wilput"

Egypt
Sigma Import Export,
P.O. Box 5,
Zamalek, Cairo, U.A.E.,
Tx 92793 ectra un

Hongkong
Jolly Sound Limited,
G.P.O. Box 8134,
111-113 How Ming St. 1st fl.,
Kwun Tong, Kowloon,
Hongkong,
✆ 3-890380 / 3-890389,
Tx 55120 jslhk hx

India
Maharashtra Electronics Corp. Ltd.,
Meltron Audio Visual Div.,
Plot A-70, MIDC Industrial Area,
Andheri (East),
Bombay 400093,
✆ 579483,
Tx 11-6817 mein in

Iraq
Sami Yusif Al-Ani,
Hieder Khana,
Rashid Street 171 h/1,
Baghdad,
✆ 87800,
Cable: butaha

Iran
Armad International,
P.O. Box 66-1570,
Teheran,
✆ 248717,
Tx 213648 amd ir

Israel
Rondo Electronics,
10, Malchei Israel Sq.,
Tel Aviv 64951,
✆ 266710,
Tx 35770 coin il "Att. rondo"

Japan
General Traders, Ltd.,
2-19 Kanda Tsukasa-cho,
Chiyoda-ku,
Tokyo, 101,
✆ 03-291-2761,
Tx 24754 gentrade j

Jordan
Zerah International,
P.O. Box 93,
Amman,
✆ 62044,
Tx 21632 tower jo

Korea (Republic)
Yushin Company Inc.,
P.O. Box 2,
Yeu-Eui-Do Post Office,
Seoul,
✆ 69-3261,
Cable: audiosupply seoul

Kuwait
Al Alamiah, Electronics Int. Ltd.,
P.O. Box 23781,
Safat, Kuwait,
✆ 414140,
Tx 22694 eil kt

Lebanon
ELTEK,
P.O. Box 11-8209 Dora,
Beirut,
✆ 265048,
Tx 21148 dirodi le "att: eltek",
Cable: eltek dora

Marocco
Cogedir,
B.P. 156,
Rue Omar Slaoui,
Casablanca,
✆ 224104,
Tx 23003 cogedir m

Mexico
Electronica 2000 S.A.
Apart. Post. 19-175,
Mexico 19, D.F.,
✆ 598 67 02,
Tx 1771226 dehame

New Zealand
Magnetic Products Ltd.,
P.O. Box 47-124,
108-110 Jervois Road,
Herne Bay,
Auckland 2,
✆ 760-607,
Tx 60044 kamb nz

Pakistan
Sawaf Brothers,
137, Shadbagh,
Lahore,
✆ 321336,
Cable: cosawaf lahore

Peru
Estemac Peruana S.A.,
Casilla 224,
Av. Petit Thouars 4620,
Lima 18 (Miraflores),
✆ 455530, 456587,
Tx 25385 estemac pe

Philippines
Electro-Systems,
Corinthian Plaza, Garden Floor,
121 Paseo de Roxas,
Legaspi Village,
Makati, Metro Manila,
✆ 859996, 899943,
Tx 66282 esi pn

PR China
Jebsen & Co. Ltd.,
EMO-Dept., China Trade,
P.O. Box 97,
Prince's Bldg.,
Hongkong,
✆ 5-225111,
Tx 73221 jebsn hx

Saudi Arabia
Saudi Technical Trading Est.,
P.O. Box 1689,
Riyadh,
✆ 36896,
Tx 201602 sautec sj

Singapore / Malaysia
Jebsen & Jessen (S) Pte. Ltd.,
P.O. Box 2444,
10th Fl. Supreme House,
Penang Road,
Singapore 9044,
✆ 337 83 61,
Tx 21487 norsin rs

Sri Lanka
D. L. Abeyanayake,
44/1 Uswatte,
Moratuwa.
✆ 072-395

Sennheiser Representations

OVERSEAS

South Africa (Republic)
O. & C. Alexander Sales (Pty) Ltd.,
P.O. Box 1713,
Johannesburg 2000,
✆ 724-9366/7/8,
Tx 424161 sa

Syria
Ets. Hamdi Tarabeine,
P.O. Box 5111,
Sultan Salim St. 15,
Na'na' Garden Square, Damascus,
✆ 112424,
Tx 11037 tarab sy

Taiwan
Development Enterprise Co. Ltd.,
P.O. Box 3007,
Taipei 100,
✆ 981 1311,
Tx 31131 thekey

Thailand
Charay Electronics Inc. Ltd.,
Admin Hq. 589 Prasumane Road,
Bangkok 2,
✆ 281-3916,
Tx 84145 chareco th

Tunisia
Soger Electronique,
32, rue Garibaldi,
Tunis,
✆ 254.230,
Tx 13447 soger tn

United Arab Emirates
Allied Electronics Ltd.,
P.O. Box 4418,
Deira, Dubai, U.A.E.,
✆ 663435,
Tx 45611 alect em

USA
SENNHEISER ELECTRONIC
CORPORATION (N.Y.),
10 West 37th Street,
New York N.Y. 10018,
✆ (212) 239-0190,
Tx 421608 senelec

Venezuela
Tele Norma S.A.,
Apart. del Este 61405,
Caracas 107,
Tx 23270 telenorm ve

Sennheiser Representations EUROPE

Austria
Grothusen Ges. mbH,
Albert-Schweitzer-Gasse 5,
A-1140 Wien,
✆ 0222/97 25 29/0,
Tx 132639 ggrot a

Belgium/Luxemburg
Prolux s.p.r.l.,
Chaussée de Nivelles, 24,
B-1420 Braine l'Alleud,
✆ 02/384 4033,
Tx 25817 prolux b

Denmark
Kinovox ApS,
Industrivej 9, DK-3540 Lynge,
✆ 02 / 18 7617,
Tx 40 394 kinovox dk

Finland
Radiotukku Oy,
Höyläämötie 11,
SF-00380 Helsinki 38,
✆ 55 84 84,
Tx 121 580 ratuk sf

France
Maison Brandt Frères,
16, rue de la Cerisaie,
F-94220 Charenton le Pont,
✆ 375 97 55, 329 21 91,
Tx 230577 mbffoci f

Great Britain
Hayden Laboratories Ltd.,
Hayden House, Chiltern Hill,
Chalfont St. Peter, Gerrards Cross,
GB-Bucks SL9 9UG,
✆ 02813/8 84 47 +/89 221
Tx 849469 haylab g

Greece
Temet Ltd.,
19, Solonos Street, Athen 134,
✆ 3619 096,
Tx 2148 888 zed gr

Hungary
Grothusen Ges. mbH,
Albert-Schweitzer-Gasse 5,
A-1140 Wien,
✆ 0222/97 25 29/0,
Tx 132639 ggrot a

Iceland
Magnus Thorgeirsson, H. F.,
P.O. Box 714, Borgartun 20,
IS-Reykjavik 121,
✆ 2 67 88, Tx 2068 pfaff is

Italy
Polinia-Divisione Audio
della Exhibo Italiana s.r.l.,
Via A. Boito, 12, I-20052 Monza,
✆ 039 / 38 43 51,
Tx 315 358 polini i

Jugoslavia
Grothusen Ges. mbH,
Albert-Schweitzer-Gasse 5,
A-1140 Wien,
✆ 0222/97 25 29/0,
Tx 132639 ggrot a

Netherlands
Kinotechniek Handel b.v.,
Postbus 135,
Jan van Gentstraat 160,
NL-1170 AC Badhoevedorp,
Netherlands,
✆ 0 29 68/63 55,
Tx 15763 kiso nl

Norway
Norbritco AS,
P.O. Box 2582, Solli,
Munkedamsveien 59 B,
N-Oslo 2,
✆ 02/41 59 35,
Tx 16743 brico n

Poland
Dieter Bon,
Postfach 27,
Elgersburger Str. 29,
D-1000 Berlin 33,
✆ 8 26 19 23,
Tx: 184182 bon d

Portugal
Valentim de Carvalho Ci Sarl,
Apartado 2149,
P-1103 Lisboa Codex,
Rua Nova do Almada 95-99,
P-1200 Lisboa 2,
✆ 36 70 51/4, 321118/9, 321110,
Tx: 18420 tim p

Sweden
Sennheiser AB,
P.O. Box 22 039,
S-104 22 Stockholm,
✆ 08/54 20 95,
Tx: 19028 senab s

Switzerland
Bleuel Electronic AG,
Postfach 9,
Zürcherstraße 71,
CH-8103 Unterengstringen,
✆ 01/750 51 42,
Tx 54581 blera ch

Sennheiser Representations

EUROPE

Spain
Comercial Lavilla,
Apart. Correos 34149,
Legalidad 64-66,
E-Barcelona 24,
✆ 210 10 51,
Tx 51658 clavi e

Turkey
ARFO,
P.O. Box 189,
Selanık Cad. 45/4,
Kızılay, Ankara,
✆ 179 697,
Tx 42463 pasr tr arfo

USSR
Ancla Marketing GmbH,
Dreiberger Str. 63,
D-2903 Bad Zwischenahn,
✆ 0 44 03 / 82 91,
Tx 2 54 718 ancla d

Sennheiser Distributors

Bulgaria
Elektroimpex,
G. Washington St. 17,
Sofia,
Tx 22075 elim bg

CSSR
Kovo Außenhandelsunternehmen,
Jankovcova 2,
170 88 Praha 7,
✆ 874 32 51,
Tx 121481 kovo c

Romania
Electronum,
P.O. Box 13-90,
70 201 Bukarest,
Tx 11547 elnum r

Sennheiser Representations FEDERAL REPUBLIC OF WEST GERMANY

1000 Berlin 15
Lissner-Electronic,
Uhlandstraße 53,
✆ (030) 8 81 10 16

2000 Hamburg 1
Walter Kluxen,
Postfach 103 720,
Nordkanalstraße 52,
✆ (040) 2 48 90,
Tx 2 162 074 klux d

3000 Hannover 1
August Märtens GmbH & Co KG,
Plathnerstraße 5 a,
✆ (05 11) 81 20 38+39,
Tx 9 22 371 maeha d

4504 Georgsmarienhütte 1
Walter Diekhöner,
Postfach 1380,
Raiffeisenstraße 23/25,
✆ (0 54 01) 4 02 11,
Tx 9 4 713 wadios d

4800 Bielefeld 1
Walter Diekhöner,
Brennerstraße 247,
✆ (05 21) 2 30 71+72,
Tx 9 38 015 wdibi d

4600 Dortmund 50
Walter Diekhöner,
Am Rombergpark 19-23,
✆ (02 31) 71 40 81,
Tx 8 22 501 wdido d

5000 Köln 51
Hackner electronic GmbH,
Raderberger Str. 154-160,
✆ (02 21) 38 06 47-49,
Tx 8 886 983 hkel d

6000 Frankfurt/M. 64
NIES electronic GmbH,
Postfach 640 160,
Edisonstraße 7,
✆ (0 61 94) 3 10 86,
Tx 4 185 949 nis d

7000 Bez. Stuttgart
7302 Ostfildern 1 - Ruit
Laauser & Vohl KG,
Postfach 4145,
Scharnhäuser Straße 65,
✆ (07 11) 41 30 51,
Tx 7 23 213 lavo d

8500 Nürnberg 1
Austerlitz Electronic GmbH,
Postfach 1048,
Ludwig-Feuerbach-Straße 38,
✆ (09 11) 53 33 33,
Tx 6 22 577 azet d

8000 München 2
Hermann Adam & Co KG,
Postfach 200 207,
Landwehrstraße 39, II Rbg.,
✆ (089) 59 29 26,
Tx 5 24 974 adamh d

SENNHEISER

revue

Sennheiser electronic KG.
D-3002 Wedemark
Telefon: 0 51 30 / 583 - 0
Telex: 9 24 623 sennh.

Printed in Germany