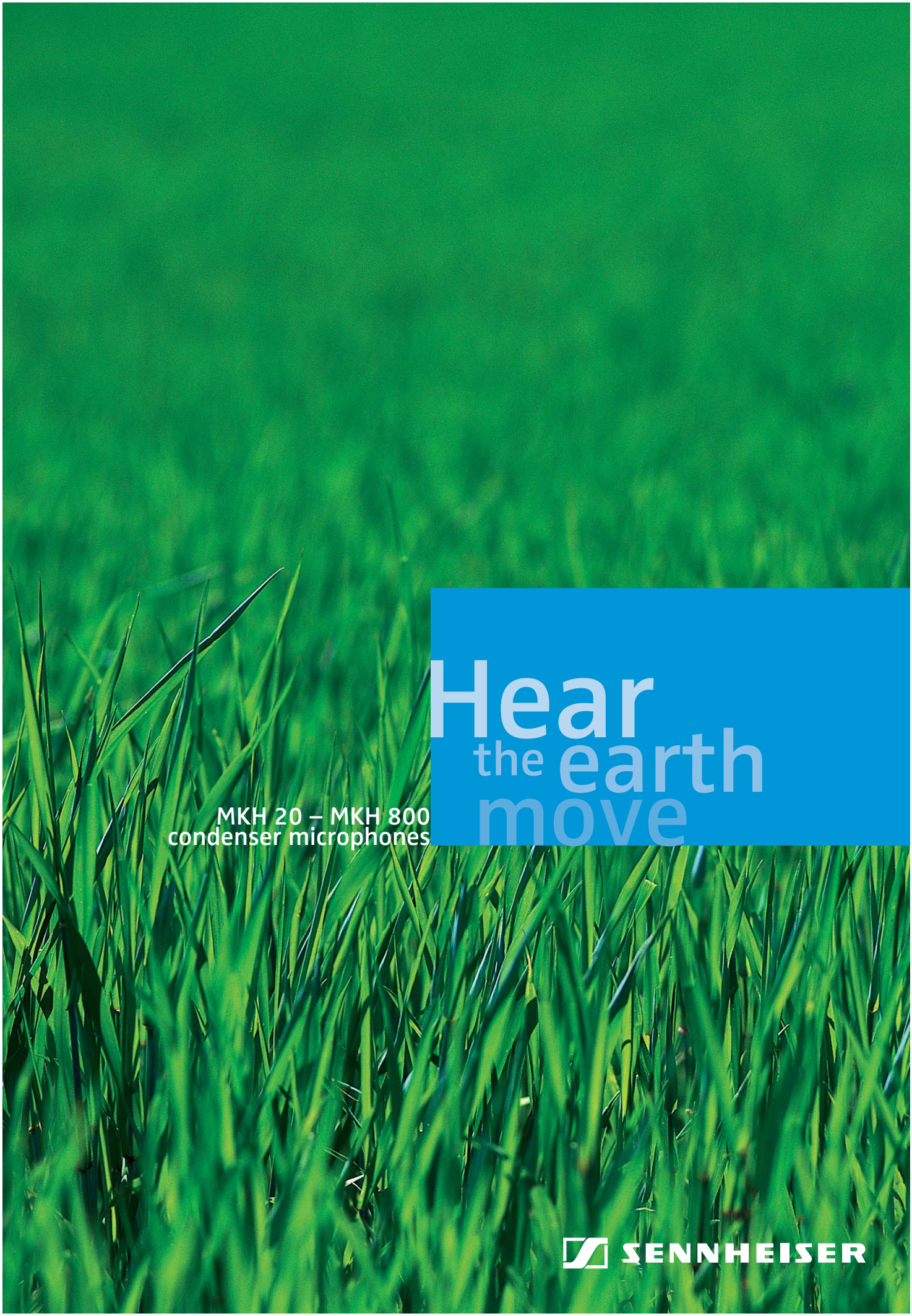

Hear
the earth
move
MKH 20 – MKH 800
condenser microphones
SENNHEISER

Sennheiser MKH 20–800:
ultra low noise, linear condenser microphone series

With the MKH 20–80 series of RF condenser microphones, Sennheiser has succeeded in creating a superb synthesis of sound aesthetics and engineering perfection. These microphones are designed of recording to the most exacting criteria.
The same critical enineering and design principles are common to all models in the series; covering the whole range of directional characteristics.

Extremely low inherent self-noise for exceptionally accurate sound reproduction:

The dynamic range of a microphone is determined by the inherent self noise at the lover end of the range, and the maximum sound pressure capability at the other end. The noise of the transducer, together with acoustic and electrical active resistances, mask quieter sounds. Sound effects, outdoor recordings and "classical" programme material – which exhibit a wide dynamic range – are particularly affected by this. The potential improvements afforded by the latest high-bit digital audio recording technology only become apparent with extremely low.

Exceptionally flat frequency response The condenser capsule initially produces a frequency response which closely reflects the response of the human ear. In paralleling human hearing characteristics the frequency response peaks at around 3,5 kHz in the area of greatest sensitivity; decreasing at the upper and lower ends of the range. The frequency response is then linearised in the integrated amplifier circuitry, providing a fully balanced audio signal. As result of this design, the output is perfectly symmetrical, grounded and transformerless. **Special attention is paid** to the off-axis response, so sounds picked up from other directions remain uncoloured and do not impair the resultant signal. The response obtained from the MKH 30 figure-8 microphone ist unsurpassed: The polar patterns for different frequencies are virtually identical. The on-axis frequency response is the same as that of an omni-directional microphone. As a result the MKH 30´s output signal is particularly easy to use.

High Linearity The uniquely symmetrical capsule design of the Sennheiser MKH microphones – with identical back electrodes located both in font of and behind the diaphragm – reduces the colouration caused by intermodulation distortion. The 16 mm diaphragm diameter represents the optimum compromise between inherent self-noise and a smooth frequency response. Although larger diaphragms produce less static noise, they have a more marked colouration effect on off-axis sound at higher frequencies. Unlike conventional condenser microphones with small diaphragms, the bass response of the MKH series is on a par with that of large diaphragm microphones.

Harmonious sound balance from omnidirectional, figure-8, cardioid, and supercardioid, up to short and long interference tube (gun) microphones From the MKH 20 to the same acoustic transducer. This ist the principle reason for the generic tonal qualities shared by this series or microphones. The conformity of the MKH 30 (figure-8) and the MKH 60 and 70 (interference tube) microphones with the whole series deserves a special mention. The sound engineer is able to equip himself with microphones of the highest sound compatibility for use even in difficult conditions.

Convenient an lightweight, but robust suitable for outdoor applications, radio and television recording

• Low weight, durable metal design. • Minimal susceptibility to climatic conditions on outdoor shoots. • High sensitivity, ensures an excellent signal-to-noise-ration even for weak signals • Various frequency response adjustment possibilities allow the micrphones to be adapted to specific recording conditions.

Reliable accessories support an extensive range of applications

Windshields with various levels of protection are essential, particularly for mobile use. Shock mounts made of highly durable materials which remain elastic even at low temperatures, attenuate impact noise by over 20 dB. Power supply units are available for this series of microphones which all require 48 V phantom power.

The series with sound compability

High linearity in all pick-up patterns

1 MKH 20 showing it´s omni-directional pick-up pattern
2 MKH 30 showing it´s figure-8 pick-up pattern
3 MKH 40 showing it´s cardioid pick-up pattern
4 MKH 50 showing it´s super-cardioid pick-up pattern

The standard sound concept for all Sennheiser MKH microphones

A wide range of pick-up patterns is required for sound recording, particularly in studio use. The range of pick-up patterns is illustrated by the photographs on this double page. These not only show the angle of incidence of the individual condenser microphones, but also the angle of maximum sound cancellation.

The MKH 20 (omni-directional) and MKH 40 (cardioid) are microphones for universal studio use – as traditional main microphones for recording vocals and instruments.

The MKH 20, with ist "soft" directivity, is linear up to very high frequencies. Unavoidable high frequency attenuation in the diffuse sound field can be compensated of, in three steps of 2 dB, by using the diffuse field switch and/or the supplied attachable pressure build-up ring. The MKH 40 discriminates against 180° off-axis sounds to give a more "focused" sound or to provide effective control in difficult acoustic situations. The MKH 30, with its figure-8 pick-up pattern and ourstandingly smooth frequency response, is a versatile main or support microphone. It effectively suppresses 90° off-axis sounds, and is particularly useful in the effective suppression of sound from adjacent intruments or of structural reflections in unfavourable acoustics, as well as ist classic use as the side microphone of an MS pair.

The MKH 50 supercardioid, when used as a precision support microphone, provides a highly directional pick-up pattern, suitable for "spot" or "close" microphone techniques. The minimum off-axis attenuation is 9.5 dB. This level is achieved at 90° and 180°. The maximum attenuation level of >20 dB occurs at around 120°.

With the MKH 60 (short gun) and MKH 70 (long gun) interference tube microphones, low sound levels are faithfully reproduced. Individual instruments are thus isolated from the carpet of sound and quiet sounds are highlighted.

5 MKH 60 showing it´s short gun / lobar pick-up pattern
6 MKH 70 showing it´s long gun / lobar pick-up pattern
7 MKH 416 showing it´s blindtext pick-up pattern
8 MKH 418 showing it´s blindtext pick-up pattern

Tonal compatibility

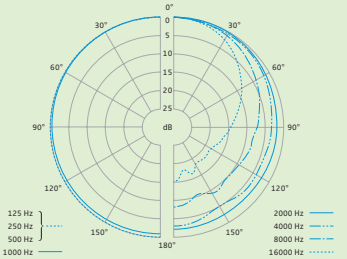
All MKH 20-80 series microphones can be used together without introducing any tonal inconsistencies. All polar-patterns in the series have essentially the same sound, only the directivity is different.

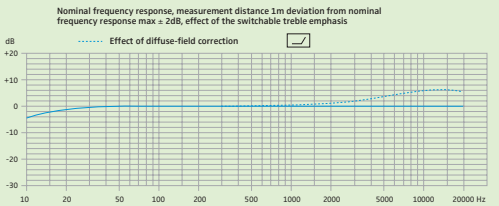
The switchable pattern MKH series condenser microphone

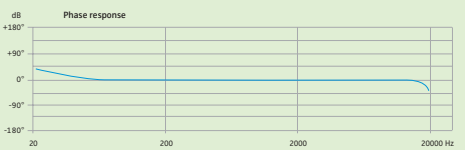
The MKH 80 is a condenser microphone with five switchable pick-up patterns. It contaius a newly developed, exceptionally transparent, twin transducer capsule with two highly linear push-pull transducers poerating in acoustic harmony. It includes the following unique features: • Extremely low inherent self-noise and high transducer linearity. Giving pure and clean sound structures down to the finest detail even at high recording levels. • Excellent senditivity at high signal levels, and high gain low noise amplification minimise the system noise caused by succeeding microphone amplifiers. • Lack of colouration in both the direct and dirruse sound fields due to the accurate pick-up patterns which are virtually frequency-independent down to the lowest frequencies, and the minimal interference caused by the microphone body and sound inlet. • Visually unobtrusive due to its compact design. • Adjustment for various recording situations by means of additional switching functions: preattenuation 6/12 dB, treble emphasis +3/6 dB, bass attenuation –3/6 dB.

MKH 20

- Microphone with omni-directional pick-up pattern
- Exceptionally low inherent self-noise
- 1 Exceptionally flat frequency response, switchable for near and diffuse field applications
- High frequency response can be accentuated by means of a special pressure build-up ring
- 2 Slightly increasing directivity at high frequencies to adjust tonal balance
- High sensitivity
- 3 Switchable pre-attenuation







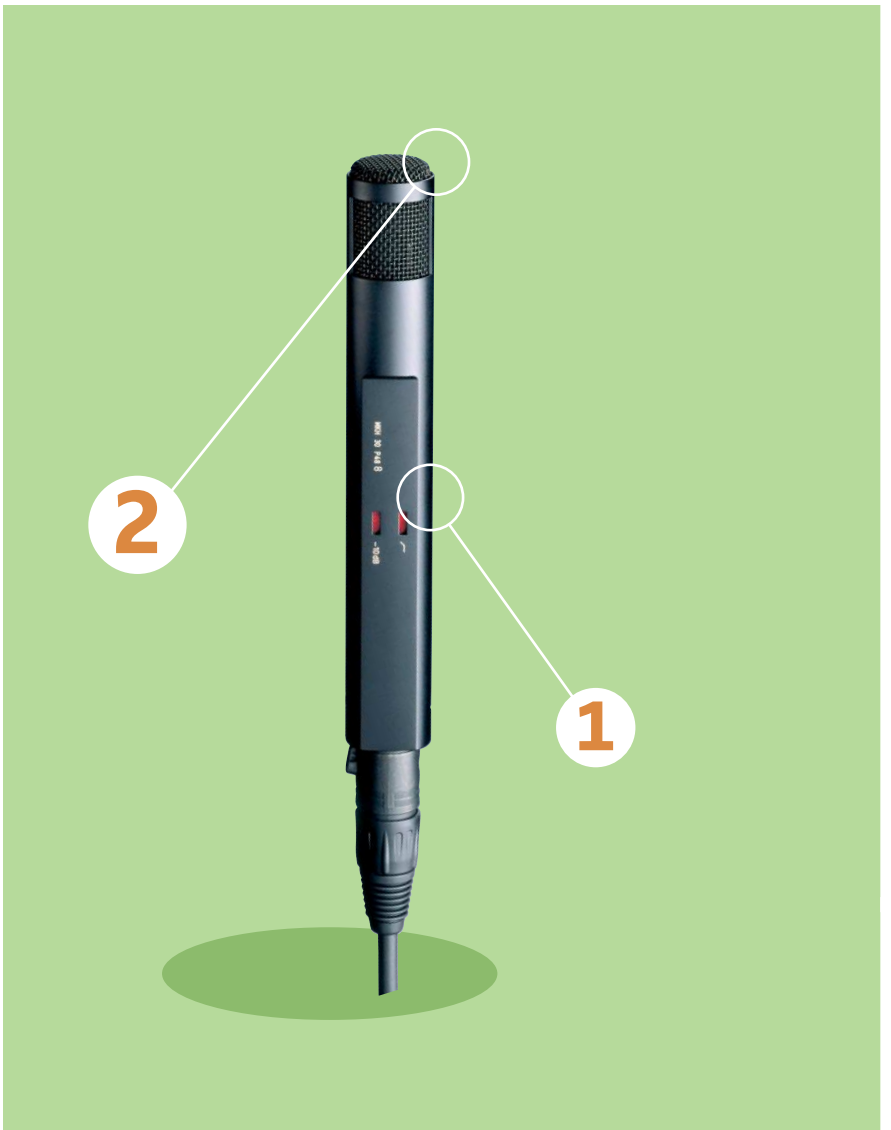
Technical Data

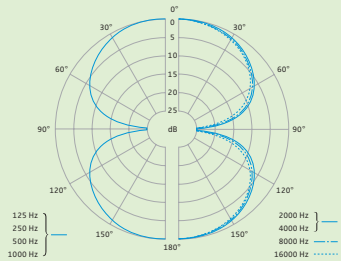
Acoustic principle	pressure microphone
Pick-up pattern	omni-directional
Frequency response	12 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa (8 mV / Pa ± 1dB)
Nominal impedance	150 Ω
Minimum load impedance	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	10 dB (18 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	20 dB (27 dB)
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Maximum output voltage	2.5 V
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 153 mm
Weight	approx. 100 g

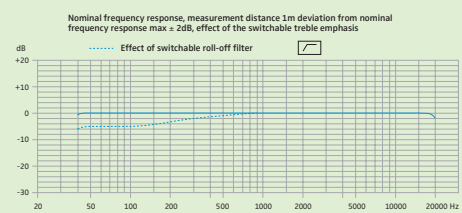
Values in brackets apply when pre-attenuation is activated (-10 dB)

MKH 30

1 Pressure gradient microphone with figure-8 pick-up pattern
Highly symmectrical and frequency-independent pick-up pattern
High rejection of lateral sounds
Wide, flat frequency response
Exceptionally low inherent self-noise
2 Switchable roll-off filter to compensate for proximity effects at a distance of approx. 0.5 m
Switchable pre-attenuation







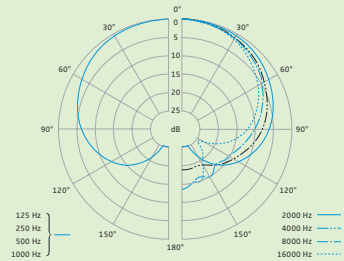
Technical Data

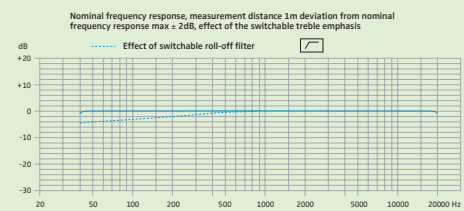
Acoustic principle	pressure gradient microphone
Pick-up pattern	figure-8
Frequency response	40 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa (8 mV / Pa ± 1dB)
Nominal impedance	150 Ω
Minimum load impedance	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	13 dB (18 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	22 dB (27 dB)
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Maximum output voltage	2.5 V
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 174 mm
Weight	approx. 110 g

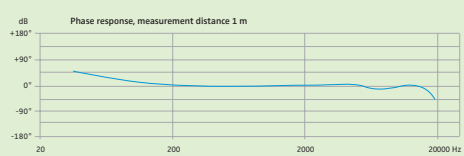
Values in brackets apply when pre-attenuation is activated (-10 dB)

MKH 40

- Pressure gradient microphone with cardioid pick-up pattern
- Maximum front-to-back ratio
- Exceptionally low inherent self-noise
- High sensitivity
- Switchable roll-off filter to compensate for proximity effects at a distance of approx. 0.5 m
- Switchable pre-attenuation







Technical Data

Acoustic principle	pressure gradient microphone
Pick-up pattern	cardioid
Frequency response	40 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa (8 mV / Pa ± 1dB)
Nominal impedance	150 Ω
Minimum load impedance	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	12 dB (18 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	21 dB (27 dB)
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Maximum output voltage	2.5 V
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 153 mm
Weight	approx. 100 g

Values in brackets apply when pre-attenuation is activated (-10 dB)

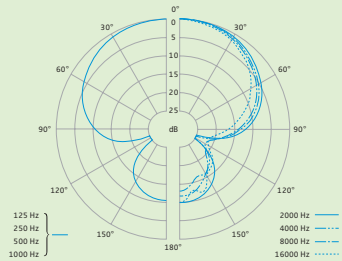
MKH 50

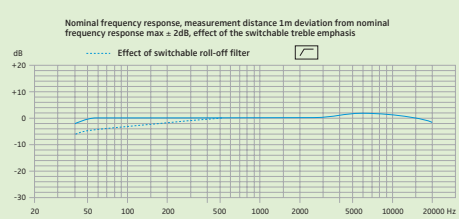
- Pressure gradient microphone with super-cardioid pick-up pattern
- High rejection of lateral sounds
- Constant directivity over the whole frequency range
- Exceptionally low inherent self-noise
- High sensitivity
- Switchable roll-off filter to compensate for proximity effects at a distance of approx. 0.5 m
- Switchable pre-attenuation

Technical Data

Acoustic principle	pressure gradient microphone
Pick-up pattern	super-cardioid
Frequency response	40 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa (8 mV / Pa ± 1dB)
Nominal impedance	150 Ω
Minimum load impedance	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	12 dB (18 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	21 dB (27 dB)
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Maximum output voltage	2.5 V
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 153 mm
Weight	approx. 100 g

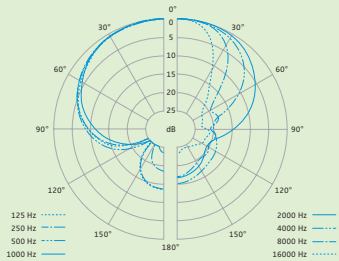
Values in brackets apply when pre-attenuation is activated (-10 dB)

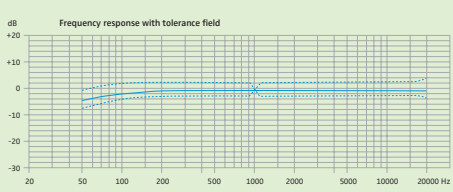


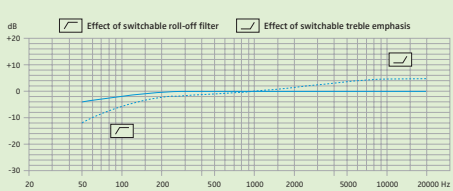


MKH 60

- Interference tube (short gun) microphone with super-cardioid / lobar pick-up pattern
- High directivity throughout the whole frequency range
- Very lightweight
- Exceptionally low inherent self-noise
- High sensitivity
- Switchable treble emphasis
- Switchable roll-off filter
- Infrasonic cut-off filter (-18 dB/oct.)
- Switchable pre-attenuation







Technical Data

Acoustic principle	interference tube microphone
Pick-up pattern	super-cardioid / lobar
Frequency response	60 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	40 mV / Pa (12.5 mV / Pa)
Nominal impedance	150 Ω
Minimum load pressure level	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	9 dB (16 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	21 dB (27 dB)
Max. sound pressure level at 1 kHz	125 dB (142 dB)
Bass attenuation	5 dB at 100 Hz, switchable
Treble emphasis	5 dB at 10 Hz, switchable
Pre-attenuation	10 dB, switchable
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 280 mm
Weight	approx. 160 g

Values in brackets apply when pre-attenuation is activated (-10 dB)

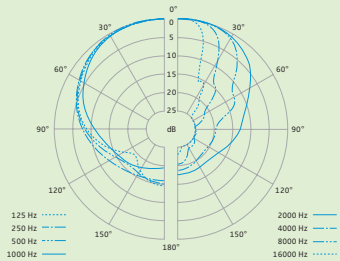
MKH 70

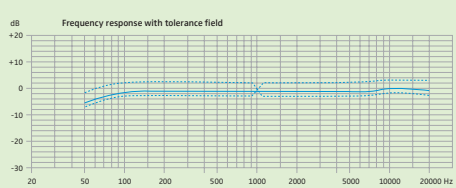
- Interference tube (long gun) microphone with lobar pick-up pattern
- Very high directivitiy throughout the whole frequency range
- Very lightweight
- Exceptionally low inherent self-noise
- High sensitivity
- Switchable treble emphasis
- Switchable roll-off filter
- Infrasonic cut-off filter (-18 dB/oct.)
- Switchable pre-attenuation

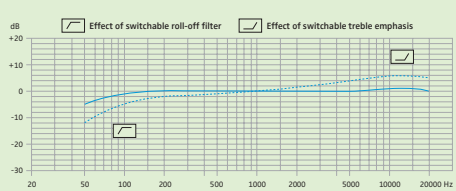
Technical Data

Acoustic principle	interference tube microphone
Pick-up pattern	lobar
Frequency response	60 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	50 mV / Pa (15 mV / Pa)
Nominal impedance	150 Ω
Minimum load pressure level	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	8 dB (18 dB)
CCIR-weighted (DIN 45 405, CCIR 468-3)	20 dB (27 dB)
Max. sound pressure level at 1 kHz	123 dB (142 dB)
Bass attenuation	5 dB at 100 Hz, switchable
Treble emphasis	5 dB at 10 Hz, switchable
Pre-attenuation	10 dB, switchable
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	2 mA
Connector	XLR-3
Dimensions	Ø 25 mm x 410 mm
Weight	approx. 190 g

Values in brackets apply when pre-attenuation is activated (-10 dB)

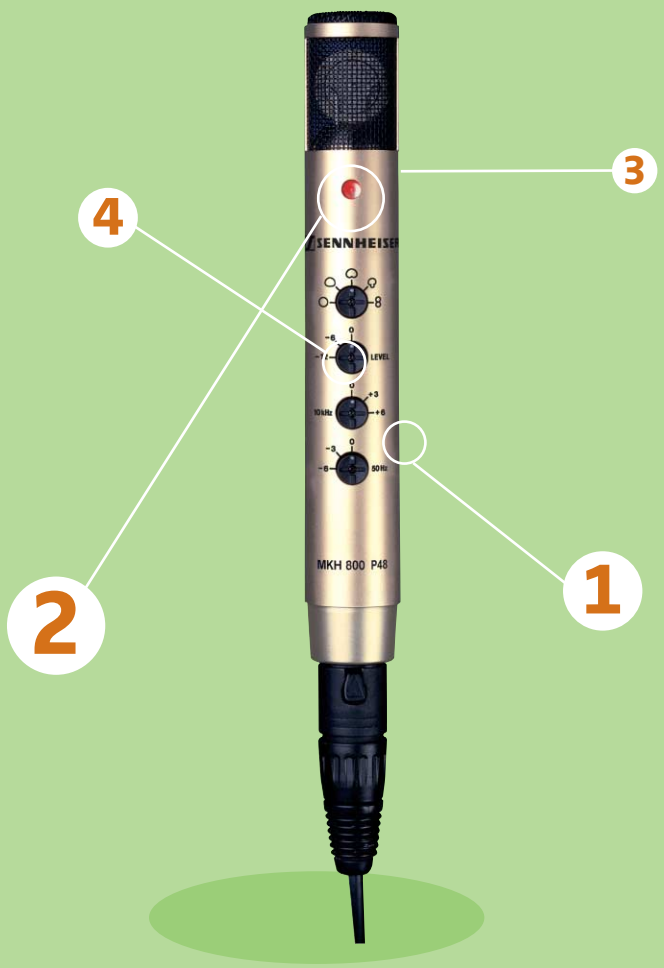






MKH 800

1 Extended frequency response up to 50 kHz
Wide, flat frequency response
Exceptionally low inherent self-noise, wide dynamic range
2 Switchable pre-attenuation, switchable roll-off filter and switchable treble emphasis
Transformerless and fully floating balanced output
3 LED for on-axis alignment
4 Anodised light metal body



Technical Data

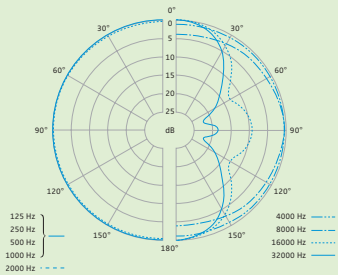
Acoustic principle	interference tube microphone
Pick-up pattern	omni-directional, wide cardioid, cardioid, supercardioid, figure-of-eight
Frequency response	30 – 50.000 Hz
Sensitivity (free field, no load) at 1 kHz	40 mV / Pa ± 1 dB
Nominal impedance	150 Ω
Minimum load pressure level	1000 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN IEC 651)	10 dB
CCIR-weighted (CCIR 468-3)	20 dB
Max. sound pressure level at 1 kHz	136 dB (142 dB)
Bass attenuation	5 dB at 100 Hz, switchable
Treble emphasis	5 dB at 10 Hz, switchable
Pre-attenuation	10 dB, switchable
Phantom power supply (P 48, DIN 45 596)	48 ± 4V
Supply current	3 mA
Connector	XLR-3
Dimensions	Ø 26.7 mm x 176
Weight	approx. 135 g

Values in brackets apply when pre-attenuation is activated (-10 dB)

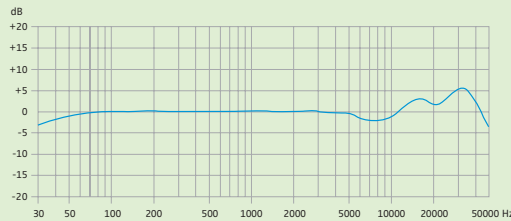
Techncal Data?

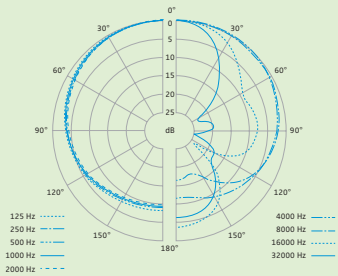
MKH 800

pick-up-patterns and nominal frequency response curves

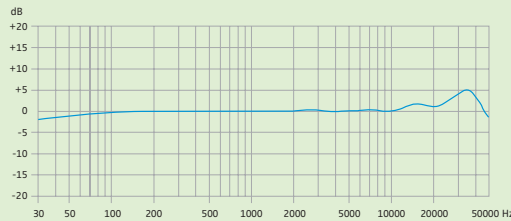


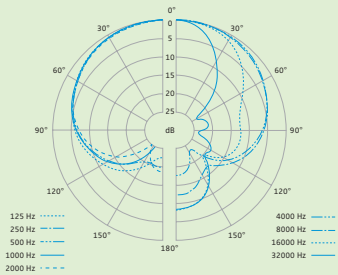
Omnidirectional



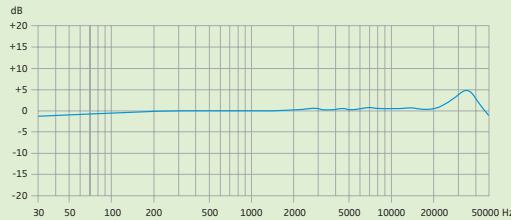


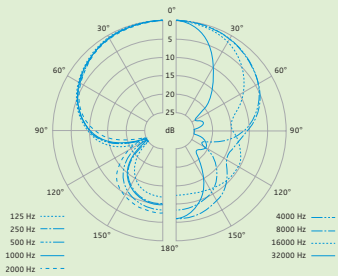
Wide cardioid



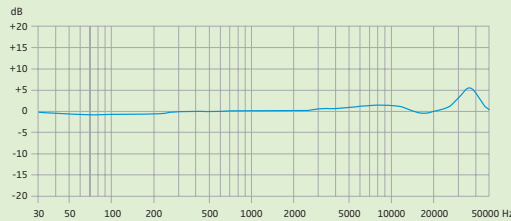


Cardioid





Supercardioid



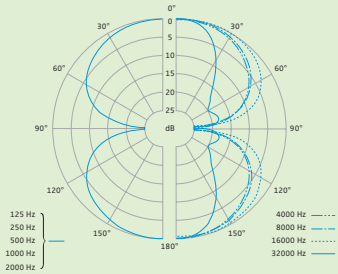
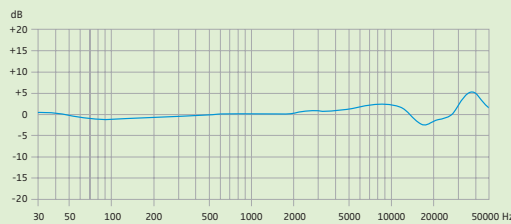
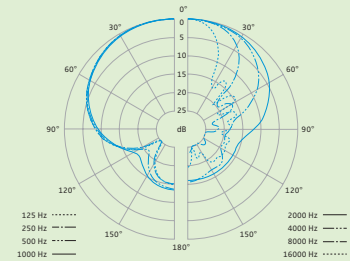


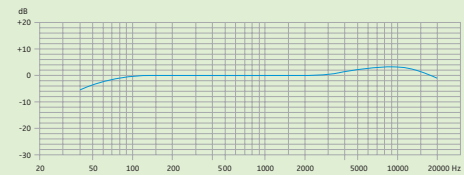
Figure-of-eight

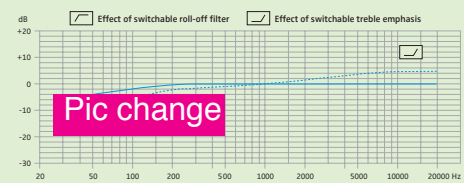


MKH 416

- Increased directivity due to interference tube principle
- Very low inherent self-noise
- High sensitivity
- Transformerless and fully floating balanced output
- Rugged, suitable for adverse climatic conditions
- Matt black all-metal body







Technical Data

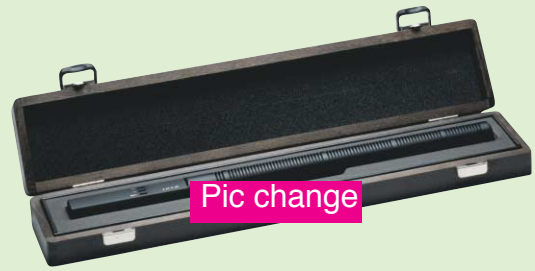
Acoustic principle	interference tube microphone
Pick-up pattern	super-cardioid / lobar
Frequency response	60 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa ± 1dB
Nominal impedance	25 Ω
Minimum load pressure level	800 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	13 dB
CCIR-weighted (DIN 45 405, CCIR 468-3)	24 dB
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Voltage	Phantom 48 ± 12V
Supply current	2 mA
Dimensions	Ø 19 mm x 250 mm
Weight	approx. 165 g

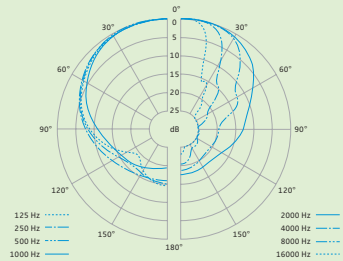
Values in brackets apply when pre-attenuation is activated (-10 dB)

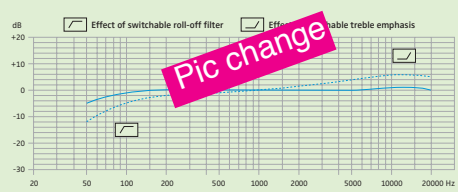
Techncal Data?

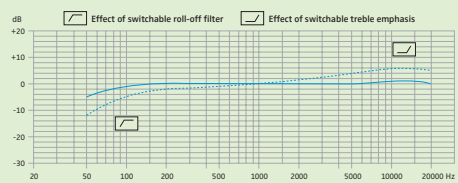
MKH 418

- Increased directivity due to interference system (M)
- Very low noise
- High sensitivity
- Symmetrically ungrounded output without repeater
- Convincing spatial representation
- Universal application due to M-S format
- Sturdy and very weather-resistant
- Full metal casing, matt black









Technical Data

Acoustic principle	stereo shortgun microphone
Pick-up pattern	lobar
Frequency response	60 – 20.000 Hz (-3 dB)
Sensitivity (free field, no load) at 1 kHz	25 mV / Pa ± 1dB
Nominal impedance	25 Ω
Minimum load pressure level	800 Ω
Equivalent sound pressure level due to inherent noise	
A-weighted (DIN 45 634, IEC 179)	13 dB
CCIR-weighted (DIN 45 405, CCIR 468-3)	24 dB
Max. sound pressure level at 1 kHz	134 dB (142 dB)
Voltage	Phantom 48 ± 12V
Supply current	2 mA
Dimensions	Ø 19 mm x 280 mm
Weight	approx. 220 g

Values in brackets apply when pre-attenuation is activated (-10 dB)

Technical Data?

The extensive range of MKH accesories

one with omni-directional pick-up patternone with omni-directional pick-up patternone with omni-directional pick-up

MZN 16 P 48 U

MZA 14 P 48

Phantom power supply units

The MZN 16 P 48 U is a 48 V phantom power supply capable of supplying two MKH microphones. It can be connected to any mains voltage from 95-265 V. Maximum current consumption is 3 mA per channel. Dimensions: 168 x 120 x 50 mm. Weight: 1100 g.
The MZA 14 P 48 is a 48 V battery phantom power supply for a single MKH microphone and will operate for about 25 hours from a single 9 V, IEC 6 LF 22 (PP3 size) alkaline manganese battery. It incorporates: Switchable bass attenuation of 8 or 14 dB at 50 Hz , and level attenuation of 10 or 20 dB. Its maximum output voltage is 550 mV for 1% distortion and it has a terminating impedance of 1 kOhm. Dimensions: 140 x 46 x 76 mm.

MZT 441

Table stands

Sturdy metal table stand with 3/8“ fixing screw.

MZS 80

Shock mount

Special shock mount for the MKH 80.
The microphone can be turned in any direction.

MZP 80

Pop protection

The MZP 80 is a stand mounted „popper-stopper“ to attenuate explosive breath noises, especially useful for vocal recording.

MZS 30

Shock mount

Shock mount for the MKH 30.
The microphone can be adjusted in any direction.

MZD 30

Dual Clip

The MZD 30 is a dual clip for attaching a second MKH microphone to the MKH 30 figure-8 microphone for MS stereo recording. Manufactured from highly durable Hytrel.

MZS 40

Shock mount

MZS 40 Flexible suspension for MKH 20/40/50 or the MKH 30 plus MKH 20, 30, 40, 50 used as an MS pair. Stronger rubber O-rings are supplied with the shock mount for fitting the MKH 60 or 70. Effectively suppresses the transmission of structure borne noise.

MZW 20-1

MZW 60-1

MZW 70-1

Basket windshields

Manufactured in three sizes to accommodate different microphone lengths, these sturdy, lightweight basket windshields offer the greatest protection against many of the problems experienced during outdoor applications.

MZW 61, MZW 71

MZW 80, MZW 41

Windshields

These windshields are made of an open cell foam material that represents the best compromise between minimal effects on the frequency response and maximum protection against wind and pop noise. The MZW 61 and 71 are particularly effective due to the spezial treatment applied to the surface and can be colourcoded for improved identification.

MZH 20-1

MZH 20-1 with MZS 20-1 and MZW 20-1

MZH 60-1

MZH 70-1

Hairy covers

Used in conjenction with the basket windshields shown above these long fibre polyester fleece covers give the maximum protection against strong wind interference noise.

MZS 20-1

Shock mount

This shock mounts is needed when using the MKH 20 – MKH 70 (or the MKH 416) microphones with basket windshields. The pistol grip can be replaced, if required, with the supplied adaptor for use on microphone stands or boom poles. Manufactured from fibreglass reinforces plastic and Hytrel, which remains flexible even at low temperatures, make this unit extremely reliable and lightweight.

Intensity stereo recording techniques

Stereo techniques are defined by the way they use the original signal´s level an phase differences at the microphones to record te left and right audio channels.
The only way, however, to record a stereo signal which is completely mono compatible is to use a techique that relies solely on level differences, since no phase differences can detract from the combined signal quality. The main microphone for purely level-dependent stereo recordings should be a coincident or a stereo microphone, which theoretically means that both caplsules are in the same housing as close to one another as possible.
Due to the general availability of higher quality microphones in individual housings it is more practical to use two small, separate microphones and place their membranes as close together as possible. In this configuration the audio signal reaches both microphones at almost the same time and is thus completely in phase. The level difference between the channels is a result of the directionality of the two microphones. Coincident or closely spaces microphones can be used for both XY of MS stereo recording techniques.
For recording with the XY technique two identical, directional microphones are pointed at equal and opposite offset angles to the left and right. This technique will result in direct left and right channel signals.
With the MS technique the M-microphone records the mono signal and the S-microphone records the directional information. The M-microphone can have any polar pattern at all (omni to highly directional) and is pointed at the center of the sound source, the S-microphone on the other hand must have a figure-of eight polar pattern and have its positiv recording axis pointing to the left of the sound sources at a right angle.
This configuration will not deliver the left and right channel signals directly as did the XY technique, but rather the two signals need to be added and subtracted form each other to retrieve the stereo signal. This is accomplished by adding the two signals once in phase to create the left channel signal and once exactly out of phase to create the right channel signal.

Of great importance in any stereo recording technique is the recording angle which determines the spacial recreation of sound during playback (stereo spread). The recording angle is limited on both sides by the direction of sound incidence resulting in large level differences between the stereo signals. With the XY technique the recording angle is determined by the angle between the two microphones as well as their directional characteristics. The recording angle and the microphone angle always behave oppositely in this technique, as the included angle between the microphones increases the recording angle decreases and vice versa.
The recording angle in the MS technique depends on the directionality of the mono microphone and the M/S signle ratio. Graphically the recording angle can be determined by the intersection, or point of closest proximity, between the polar plots of the M and S microphones. After matrixing (adding and subtracting) the signals, the level differences between the channels will be largest at these points. Generally, a less directional M signal or a smaller S signal will result in a bigger recording angle.
Since MS and XY signals can be mathematically transformed into one another (L = 0.71 x (M+S), R = 0.71 x (M-S) or M = 0.71 x (L+R), S =0.71 x (L-R)), it is in theory possible to interchange MS and XY microphone set-ups. Due to deviations form a microphone´s ideal directional characteristic, especially at high frequencies, there are limits to this interchangability.

XY / MS – stereo recording techniques in comparison

The following figures give a survey of the MS and XY microphone set-up characteristics. In order to facilitate a better comparison the signals of both techniques are shown in the MS format. The front facing curve represents the M or mono signal and the side facing signal represents the S signal. The S signal level determines the stereo effect and affects, for example, the deviation of the stereo carrier in FM radio transmissions or the vertical displacement of a record player´s stylus.
The XY figures show the influence of micprohone angles for different directional characteristics on the recording angle (microphone angle = between microphone = 2 x angle between recording center and microphone). In turn the MS figures show the influence of S signal levels for different directional characteristic of the M microphone on the recording angle.
On the polar plots the curves are drawn on a logarithmic scale with a level range from 20 dB to + 5 dB ins steps of 5 dB.
0 dB corresponds to the out-put levels of the X and Y microphones when excited by axially impinging sound.
On the polar plots the outer ring shows the frontal recording angles and in most cases an additional rear recording area which also enables stereophonic recording. The rear recording area can deliver a true or side inverted stereo image depending on whether the mono microphone´s directional characteristic is between omnidirectional and cardioid or cardioid and figure-of-eight. The angles shown in the upper portion of the figures indicate the frontal recording area and the lower angles indicate the rear recording area. The areas between the front and rear recording angles deliver stereo signals with out-of-phase parts. This will deteriorate the stereo imaging during playback and add ambiophonic effects as a sort of spaciousness to the total impact of the recording.

XY figure-of-eight

For this XY microphone configuration the mono signal´s directional characteristic is always figure-of eight shaped, independent of the microphone angle. Due to the symmetric nature of the polar patterns the recording angles from the front and rear will be equal, with the rear imaging always being side inverted. The angle of the ambiophonic areas will be equal to the microphone angles. For 90° included angles (crosses microphone pairs) the corresponding MS curves can be attained from the XY signal curves by rotation of 45°. Thus one can switch from the XY to the MS format by simply rotating the microphone configuration to the left by 45°.
XY with figure-of eight microphones is very useful for miking small ensembles which require small recording angles.

XY wide angle cardioid

The wide angle cardioid is not very directional with maximum attenuatin of 10 dB from the rear. The stereo signal level differences thus can not exceed 10 dB, which is barely enough to reproduce a stereo image in the middle of the playback area. This is shown by the MS diagram where the S curve is always containde within the M curve. The smallest level difference between the curves determines the point at which the frontal and the rear recording areas are separated. Since this set-up always has a frontal recording angle greater than 180° the technique allows the recording of very large sound sources surrounding the microphone set-up, but only with reduced base width.

XY cardioid

As cardioid microphones attenuate sound from the rear up to 30 dB the level differences between the two stereo channels allow a fully spread stereo image during playback. The largest level differences occur when the sound source is located directly behind one of the microphones, which is graphically represented by the piont where the M and S curves intersect. These points define the border between frontal and rear recording areas. Due to the fact that cardioid microphines record sound from all directions in phase the audio recorded from the rear is not side inverted. This XY technique is extremely easy to use and due to its big recording angle is suited ideally for the recording of large sound sources.

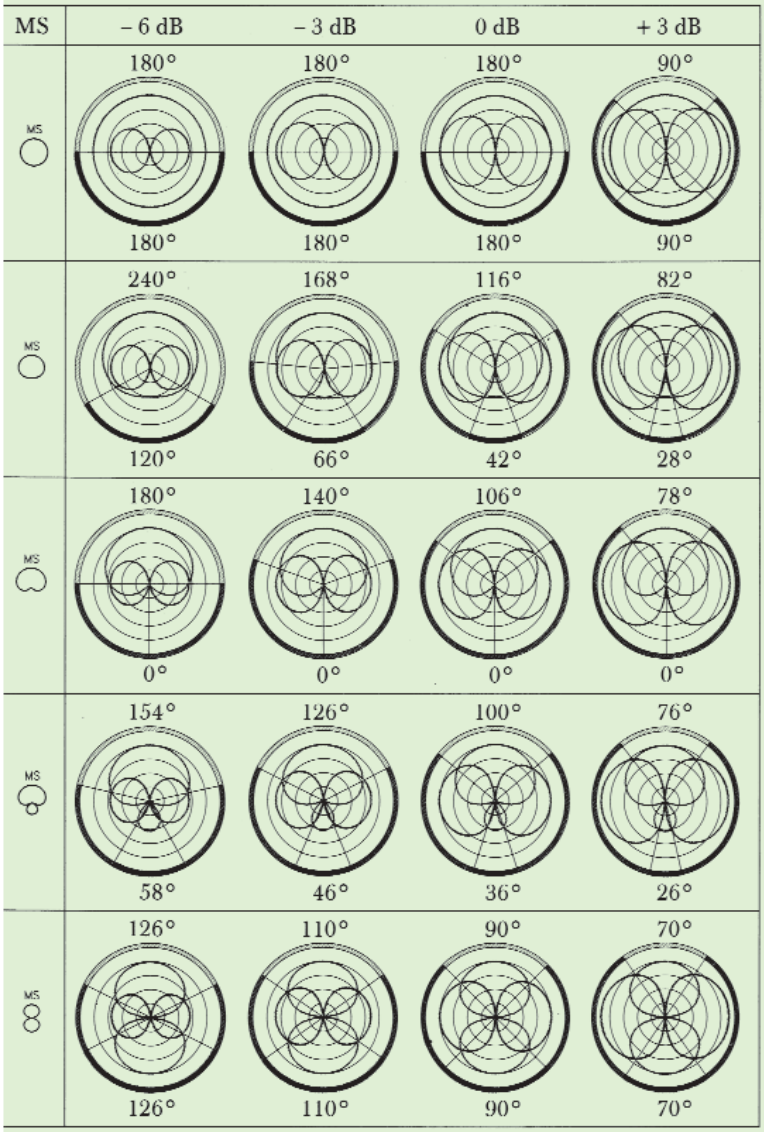
XY supercardioid

Supercardioid microphones invert the phase of any signal originating 120 degress or more off the microphone axis.
This phenomenon causes XY signals from certain directions to be partly of opposite phase. The angles at which this happens are located between the regular front and rear recording angles, where the S curve ist outside the M curve on the MS graph.
As the microphone angle approaches 120°, the rear recording angle disappears completely. At angles below 120° the signal recorded from the rear are side-inverted and above 120° they are not. The angles of both ambiophonic areas are equal to the microphone angle up to 120°, beyond that the angles are set at 120°. This XY technique has smaller recording angles than the previously discussed techniques, but many contribute a sense of stereo ambience detached from the speakers.

XY / MS – stereo recording techniques in comparison

MS omnidirectional

As omnidirectional M microphone will result in symmetric front and rear recording angles. For small S signal levels the front and rear recording angles will be 180° and touch. With further decreasing S levels the resulting signal will approach a mono format. When the M and S signals are equal the polar curves touch in two points and the stereo effect will be fully utilized.
The recording angles will still run into one another though.
Fr larger S levels there will be ambiophonic areas between the recording angles. In these the S curve is located outside the M curve. The rear stereo image is never inverted since an omnidirectional microphone records all signals with a positive phase. Small changes in S level can cause dramatic changes in recording angles. An Slevel increase from 0 dB to + 3dB halves the recording angle from 180° to 90°, a further increase by 3 dB reduces the angle to 60°.



MS wide angle cardioid

If a wide angle cardioid microphone with a rear attenuation of 10 dB is used as the M microphone then relative S levels of – 5 dB or less will cause the front recording angle to be 240° and the rear recording angle to be 120°. As the S level decreases further the resulting output will gradually turn into mono signal. As the relative S level increases above – 5 dB the recording angles decrease, while still retaining an approximate ratio of 3:1, front to back, and ambiophonic recording angles result. These areas increase quickly as the S level increases. Signals recorded from the rear are always reproduced with correct side information, since the cardioid only records signals of positive phase. The front recording angle changes at a rate of 12°/dB at 0 dB.

MS cardioid

If a cardioid M microphone is used there is no rear recording area. All sounds form directions out side the recording angle are recorded as ambiophonic signals. If the S level is around 0 dB the recording angle changes at a rate of 10°/dB.

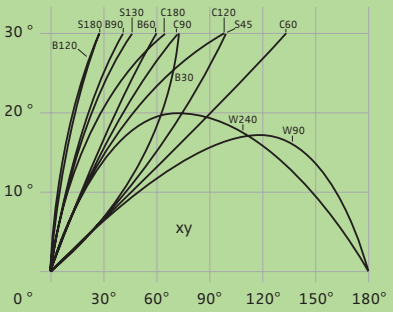
MS supercardioid

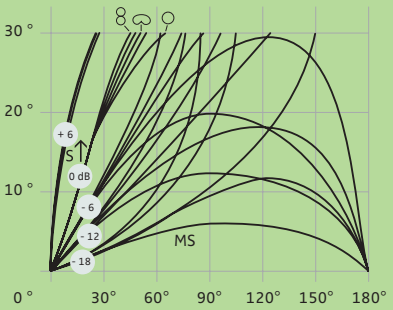
Using a supercardioid M microphone will side invert all audio recorded from the rear. The ambient areas, if compared to the cardioiid at comparable S levels, will be smaller, while the actual recording angles will be approximately the sam size. For S levels around 0 dB the front reording angle will change at 8°/dB.

MS figure-of-eight

An MS configuration with figure-of-eight microphones is strongly related to the corresponding XY configuration. Here, too, both recording angles are the same and the rear area is sideinverted. With 0 dB S level the ordinary and the ambiophonic recording areas are 90°. The front recording angle changes at 7°/dB for S levels around 0 dB.

Stereo imaging properties in comparison





The following diagrams allow a comparison of stereo imaging qualitites between the XY and MS recording techniques. The curves are referred to as the standard listening set-up, where the distance between speakers and listener is equal (60° base angle).
On the graphs the horizontal axis displays the direction of sound incidence on the microphone (0° = front, 90° = left or right side, 180° = back) and the vertical axis represents the angles at which the sound source will be located from the listener´s perspective during playback (0° = middle, 30° = left or right). Since the location of sound sources is symmetrical to the center of the base only one side is shown.
The XY and MS parameters were chosen in such a manner that groups with similar characteristics resulted for small angles of incidence on the microphone set-up. Real differences showed only for larger angles of incidense.
The XY curves are labeled by directional characteristic (W = wide angle cardioid, C = cardioid, S = supercardioid, B = figure-of-eight) and mircrophone angle. The MS curves are labeled according to relative S level which basically determines the gradient of the curves.
The directional characteristics only influence the curves at large angles of incidence.
The steepest and flattest curves are achieved by the figure-of-eight and omnidirectional microphones respectively.

For all XY or MS configurations whose curves reach the lower right hand corner on the diagrams, the front and rear recording areas run into one another and there are no ambiophonic recording areas. If the curve maximum does not touch the top of the graph the stereo imaging is limited to a part of the base between the speakers.
By comparing the two graphs it is easy to find XY and MS configurations that are identical. For example the XY configuration with two cardiods at an angle of 60° (curve C 60) is approximately equivalent to the MS configuration with a cardioid and figure-of-eight microphone with a relative S level of – 12 dB.
From the graphs it becomes obvious that with the XY technique it is necessary to use large microphone angles should the need arise to achieve small recording angles with the wide directional characteristics. The XY microphones must then be pointed at the edges of the sound thus increasing the angle of incidence of sound on the microphone. This can reduce the quality of the signal due to the changing directional characteristics or micrpohones at such extreme angles.
Curve C 180 represents two cardioid microphones pointed in opposite directions and effectively addressed from the side. In this case the equivalent MS configuration with an omnidirectional M microphone and a 0 dB S level would be the preferable solution.
The amount of curvature of the graphs is a measure for the non-linearity of the imaging ability of the microphone set-up. For instance, the XY configuration with two cardioid microphones at 60° or its MS equivalent of a cardioid and – 12 dB S level show very low "imaging distortion".

One can see that the recording angles of most configurations are relatively large and get compressed by the 60° base angle of the speaker set-up. To achieve a 1:1 angle ratio the XY technique may be used by employing crossed figure-of-eight microphones.
The MS technique achieves this with a +3 dB relative S level. As one can see by the small differences between the curves there is only little difference when M microphones with varying directional characteristics are substituted.

Advantages and Disadvantages

Advantages of the XY technique

• Left and right stereo channels are readily available. • Identical microphones can be used.

Disadvantages of the XY technique

• The recording angle must be mechanically changed at the time of recording. Varying the effect during monitoring is virtually impossible. • With the XY technique large microphone angles must often be used to achieve small enough recording angles.
The microphones are then mostly addressed from the side which causes the directional properties to be very frequency dependent.

Advantages of the MS technique

• By simply adjusting the relative S level of a recording during playback, the recording angle is changed, and the impact of that action can be heard in the stereo spread during playback.
• Adjustments of the stereo content of a signal are easily accomplished during playback.
The M microphone points directly at the signal source and thus receives the sound form a direction where its directional characteristics are largely frequency independent.
• The directional characteristics or the S microphone are almost ideal since ist figure-of-eight polar pattern is almost frequency independent. For that reason the S microphone can record objectively even from the side.
• The mono signal is not affected by the amount of stereophonic effect as the latter is controlled solely by the S signal level.
• Since the mono signal is not synthesized from two separate signals as in the XY technique comb filter effects at high frequencies are avioded.

Disadvantages of the MS technique

• The left and right stereo signals are not directly accessible, but have to be synthesized by matrixing the M and S signals.
• As different directional types are used of the M and S microphones it is highly important to get closely matched characteristics for achieving good results. Preferably microphones manufactured by the same company should be used.

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MKH 800 P 48

Microphones | RF Symmetrical Capsule Condenser Microphone

Cat. No. 004927

General Description

The MKH 800 condenser microphone is the first microphone to fully utilise the wider frequency response and dynamic range of the new high bit-rate standard of advanced digital recording systems (for example SACD). Featuring five switchable pick-up patterns, the MKH 800 is a superior microphone for any recording application, offering high clarity and the absolute minimum colouration.

Cable pictured is an accessory not supplied with the microphone

Technical Data

Pick-up patterns	omni-directional, wide cardioid, cardioid, super-cardioid, figure-of-eight
Frequency response	30 – 50,000 Hz
Sensitivity (free field, no load, 1 kHz)	40 mV/Pa ± 1 dB
Nominal impedance	150 Ω
Min. terminating impedance	2 kΩ
Equivalent noise level	
A-weighted (DIN IEC 651)	10 dB
CCIR-weighted (CCIR 468-3)	20 dB
Max. sound pressure level	136 (142) dB at 1 kHz
Power supply	phantom 48 ± 4 V
Supply current	3 mA
Dimensions	Ø 26.7 x 176 mm
Weight	135 g

Values in parentheses with attenuator switched on (6/12 dB)

Features

- Extended frequency response up to 50 kHz
- Wide, flat frequency response
- Exceptionally low inherent self-noise, wide dynamic range
- Switchable pre-attenuation, switchable roll-off filter and switchable treble emphasis
- Transformerless and fully floating balanced output
- LED for on-axis alignment
- Anodised light metal body
- Delivery includes: 1 MKH 800 P 48, 1 MZS 80 shock mount, 1 MZW 80 windshield

Recommended Accessories

MZA 14 P 48 U battery power supply unit	Cat. No. 002960
MZW 80 foam windshield, anthracite	Cat. No. 003780
MZS 80 shock mount	Cat. No. 003685
MZP 40 popshield	Cat. No. 003132

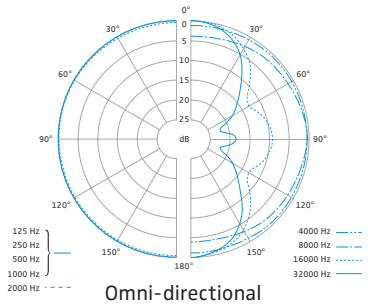
Profile

Studio microphone with 5 switchable pick-up patterns (omni-directional, wide cardioid, cardioid, super-cardioid, figure-of-eight), switchable pre-attenuation, switchable roll-off filter and switchable treble emphasis. Frequency response 30 – 50,000 Hz, sensitivity (free field, no load) 40 mV/Pa ± 1 dB at 1 kHz, nominal impedance 150 Ω, min. terminating impedance 2 kΩ, equivalent noise level A-weighted 10 dB, CCIR-weighted 20 dB, max. sound pressure level 136 (142) dB at 1 kHz, phantom powering 48 ± 4 V, supply current 3 mA, dimensions Ø 26.7 x 176 mm, weight 135 g. Values in parentheses with attenuator switched on (6/12 dB).

MKH 800 P 48

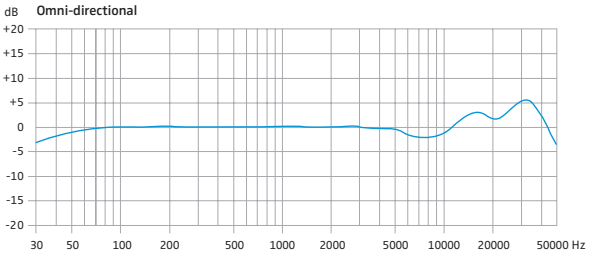
Microphones | RF Symmetrical Capsule Condenser Microphone

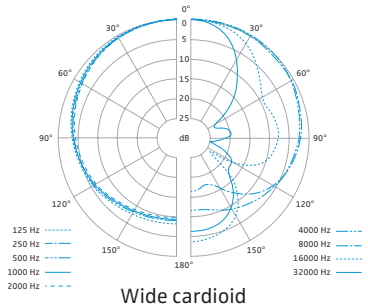
Polar Diagrams and Frequency Response Curves



Omni-directional

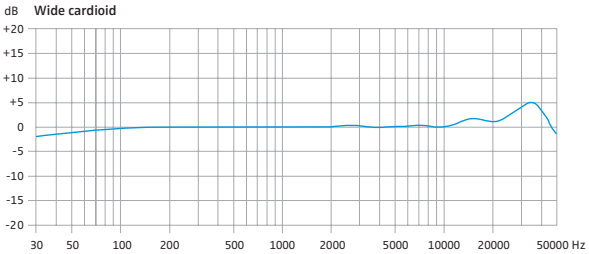
Nominal frequency response, measurement distance 1m
Deviation from nominal frequency response max ± 2dB

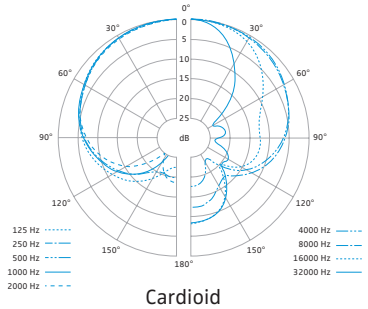




Wide cardioid

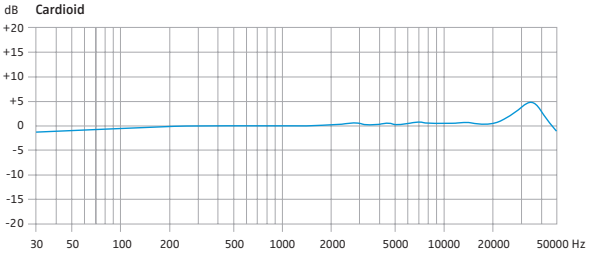
Nominal frequency response, measurement distance 1m
Deviation from nominal frequency response max ± 2dB

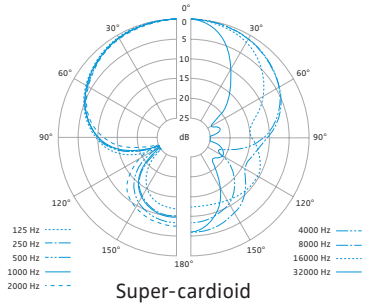




Cardioid

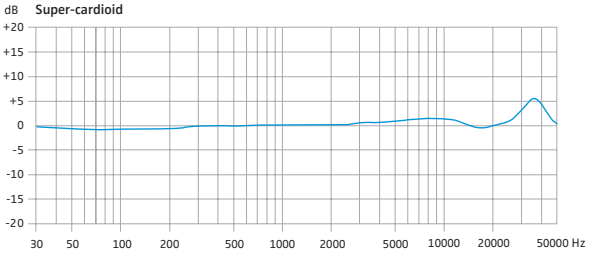
Nominal frequency response, measurement distance 1m
Deviation from nominal frequency response max ± 2dB





Super-cardioid

Nominal frequency response, measurement distance 1m
Deviation from nominal frequency response max ± 2dB



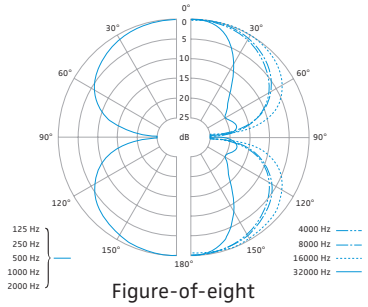
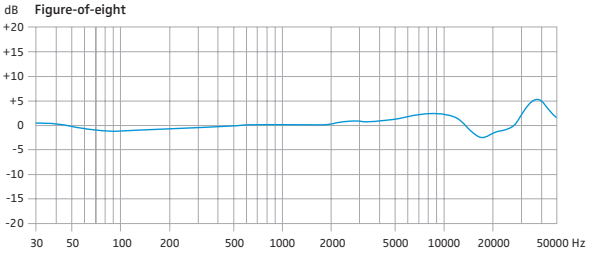


Figure-of-eight

Nominal frequency response, measurement distance 1m
Deviation from nominal frequency response max ± 2dB



MKH 416 P 48 U 3

Microphones | RF Condenser Microphone Short Gun Interference Tube Microphone

Cat. No. 001511

General Description

The MKH 416 P 48 U 3 is a short gun interference tube microphone. Its excellent directivity and compact design, high consonant articulation and feedback rejection make the MKH 416 a superb all-round microphone for film, radio and television, especially for outside broadcast applications. Also available as MKH 416 TU-3 with 12 V AB(T) powering.

Cable pictured is an accessory not supplied with the microphone

Features

- Increased directivity due to interference tube principle
- Very low inherent self-noise
- High sensitivity
- Transformerless and fully floating balanced output
- Rugged, suitable for adverse climatic conditions
- Matt black all-metal body
- Delivery includes: 1 MKH 416 P 48 U 3, 1 MZW 415 windshield

Recommended Accessories

MZA 14 P 48 U battery power supply unit	Cat. No. 002960
MZT 100 table stand	Cat. No. 001883
MZT 105-1 table stand	Cat. No. 000524
MZT 441 table stand	Cat. No. 000799
MZQ 100 quick release clamp	Cat. No. 002155
MZW 415 foam windshield	Cat. No. 000895
MZS 20-1 shock mount	Cat. No. 003609
MZW 60-1 basket windshield	Cat. No. 003607
MZH 60-1 hairy cover	Cat. No. 003224

Possible Combinations

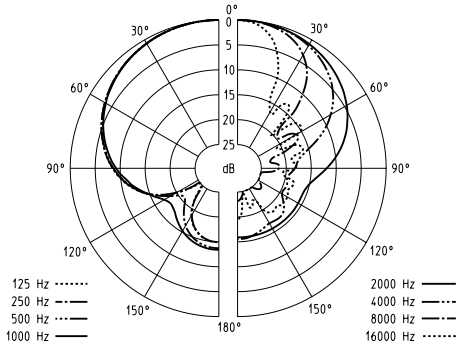
Table stand: MZT 100, MZT 105-1 or MZT 441, MZQ 100
Suspension/windshield: MZS 20-1, MZW 60-1, MZH 60-1

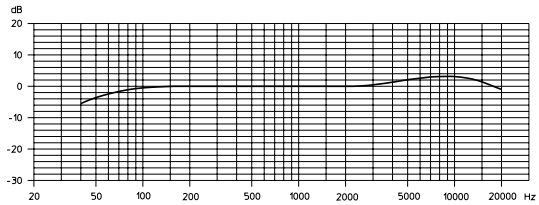
Product Variants

MKH 416 TU-3: as MKH 416 P 48 U 3, but 12 V AB (T) powered	Cat. No. 001567

Technical Data

Pick-up pattern	super-cardioid/lobar
Frequency response	40 – 20,000 Hz
Sensitivity (free field, no load, 1 kHz)	25 mV/Pa ± 1 dB
Nominal impedance	25 Ω
Min. terminating impedance	800 Ω
Equivalent noise level	
A-weighted (DIN IEC 651)	approx. 13 dB
CCIR-weighted (CCIR 468-3)	approx. 24 dB
Max. sound pressure level	130 dB at 1 kHz
Power supply	phantom 48 ± 12 V
Supply current	2 mA
Dimensions	Ø 19 x 250 mm
Weight	approx. 165 g





Profile

Super-cardioid/lobar short interference tube microphone, frequency response 40 – 20,000 Hz, sensitivity (free field, no load) 25 mV/Pa ± 1 dB at 1 kHz, nominal impedance 25 Ω, min. terminating impedance 800 Ω, equivalent noise level A-weighted approx. 13 dB, CCIR-weighted approx. 24 dB, max. sound pressure level 130 dB at 1 kHz, phantom powering 48 ± 12 V, supply current 2 mA, dimensions Ø 19 x 250 mm, weight approx. 165 g.

MKH 418 S

Microphones | RF Condenser Microphone Short Gun Interference Tube Microphone

Cat. No. 005284

General Description

The MKH 418 S is an MS stereo shotgun microphone. Its MS format, compact dimensions, very good consonant clarity and good spatial representation make it ideally suited for every type of application in film, radio, television and reporting, both indoors and outdoors.

Technical Data

Pick-up patterns	M: super-cardioid/lobar*
Frequency response	60 – 20,000 Hz
Maximum sound pressure level (passive)	130 dB (63 Pa)
Output voltage	1.5 V
Equivalent noise level CCIR-weighted (CCIR 468-3)	M: 14 dB-A/26 dB-CCIR S: 22 dB-A/24 dB-CCIR
Output impedance	25 Ω
Impedance	1 kΩ
Phantom powering	P48: 48 ± 4 V / 2 x 2.3 mA
Connector	XLR-5M
Dimensions	Ø 19 x 280 mm
Weight	220 g
Operating temperature	-20.....+60 °C

*S: Figure-of-eight

Features

- Increased directivity due to interference tube principle (M)
- Very low inherent self-noise
- High sensitivity
- Transformerless and fully floating balanced output
- Excellent spatial representation
- Superb all-round MS stereo microphone
- Rugged, suitable for aderse climatic conditions
- Matt black all-metal body
- Delivery includes: 1 MKH 418 S

Recommended Accessories

MZT 100 table stand	Cat. No. 01883
MZQ microphone clamp	Cat. No. 02155
MZS 20-1 suspension/pistol grip	Cat. No. 03609
MZH 60-1 hairy cover	Cat. No. 03224
MZW 60-1 basket windshield	Cat. No. 03607