SCHOEPS Mikrofone



CCM

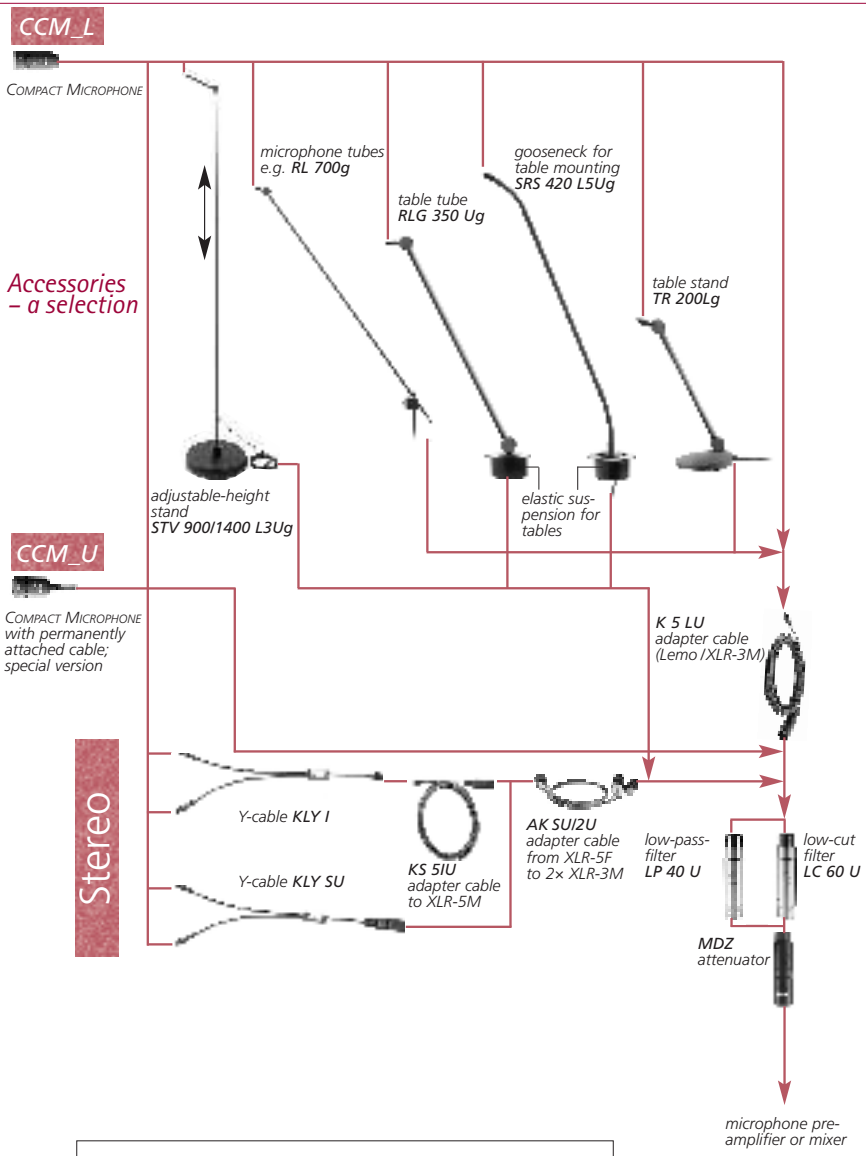
Compact Microphones

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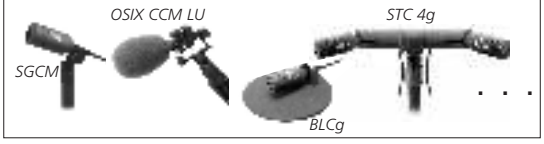
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Compact Series

User guide



Mechanical accessories for CCM_L and CCM_U – a selection



Dear customer:

Thank you for choosing a SCHOEPS CCM Compact Series microphone.

CCM microphones are the smallest true classic condenser microphones (no electret used) offering the highest possible sound quality without compromise.

The following pages contain technical information, application suggestions and advice concerning the care and maintenance of these microphones.

CCM Compact Microphones ...

- are classic condenser microphones that do not require electronic frequency response correction
- have a balanced, low-impedance output
- are for universal use
- are small and light
- have an extremely flat frequency response
- their sound is extensively independent of direction
- have low noise and distortion
- run on both 12 V and 48 V phantom feed power supplies
- can be used with very long cables (over 100 meters)



SGC

Included accessories:
SGC miniature swivel stand coupler, polished wood carrying case,
CCM_L: K 5 LU adapter cable (Lemo / XLR-3M), 5 m long

As with SCHOEPS' Colette modular microphones, a compact microphone essentially consists of two main components: an acoustic transducer (a capsule) and a microphone amplifier. These only come together in the same body with Compact Microphones.

The capsule is the component which converts sound waves into a varying electrical voltage. It determines the directionality and, for the most part, the sound quality of the microphone. The amplifier is the other main component, with the circuitry required to accept external powering, polarize (charge) the capacitive capsule, obtain the audio signal from it, and convert that signal into one which is balanced and low-impedance.

The circuitry of the Compact Microphones features a balanced, class-A output stage which does not use either coupling condensers or an output transformer. This leads to low output impedance, insensitivity to electrical interference, low distortion and light weight.

The Compact Microphones have a bass roll-off filter with a low cut-off frequency of 20Hz and a slope of 12 dB/oct.

This frequency has been chosen to protect against perturbing, inaudible (infra-) sound that can be caused by ventilation systems, track vehicles and wind. What is tricky about this is that although it is hardly noticeable, infrasound can cause strong audible distortions in the connected equipment when it leads to an overload. This would make it impossible to produce a recording that could be used. The audio range also only starts at around 20Hz. Lower frequencies are only actually discernible at high levels which are only reproducible on few audio systems, and then quickly become unpleasant.

Start up

The U-version of the CCM Compact Microphone has a permanently attached cable that terminates to a standard XLR-3M connector. These microphones can be connected directly to the corresponding microphone inputs.
To connect the L version (L= Lemo), the supplied K 5 LU cable plugs into the CCM Lemo socket. The K 5 LU cable is terminated with a standard XLR-3M connector. Put the cable's Lemo plug into the microphone port. Secure it so that the plug is not inadvertently pulled out or does not rattle while in use by simply screwing the plug's lock nut onto the microphone until it can go no further.
Please note that in order to protect the contacts you should avoid holding the lock nut and turning the microphone.

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Phantom powering

CCM microphones are electrically active components which require operating current. This will most often be supplied by the inputs of a mixer, preamplifier or recorder with suitable microphone powering built in. Otherwise, an appropriate type of stand-alone microphone power supply can be used.

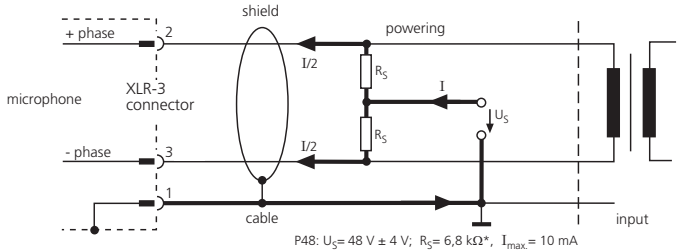
Like most modern, solid-state professional microphones, the CCM also uses a standardized powering scheme known as "phantom powering." Most recording equipment offers a 48-Volt supply for such microphones. Some equipment, however, provides a 12-Volt supply for phantom powering, or can readily be modified for such a supply. The SCHOEPS CCM compact microphones series can work with either voltage, switching its circuitry automatically to the corresponding mode of operation. It maintains the same level of performance in either mode while drawing only the necessary amount of current from the phantom supply.

Please note that the CCM compact microphones are designed to work with standard 12-Volt or standard 48-Volt phantom powering. They are therefore not "12 - to - 48 Volt" microphones. Any input to which it is connected must implement one of those two standard phantom powering methods, which means that not only must the supply voltage meet the standard, but the resistors must be correct as well.

Our microphones are developed and tested with power supplies that conform to the requirements of this standard. Proper operation with non-standard power supplies cannot be guaranteed. Circuit arrangements that deviate from the standard can cause operational problems (i.e. distortion or even gaps in the signal), particularly at high sound pressure levels or in the presence of strong wind noise. Such problems may often seem to defy analysis until their real cause is discovered.

You can find out more about phantom power supplies below.

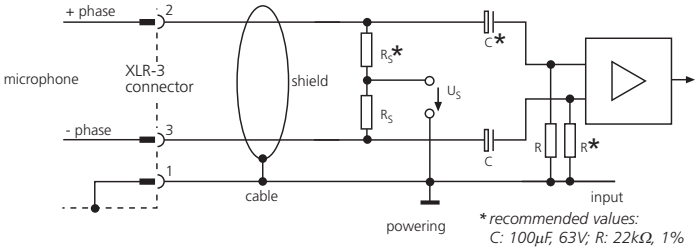
Fig. 1
input with transformer (or balanced, ungrounded transformerless input)



P48: U_S= 48 V ± 4 V; R_S= 6,8 kΩ*, $I_{max.}$= 10 mA
P12: U_S= 12V ± 1V; R_S= 680 Ω*, $I_{max.}$= 15 mA

** see note in the text concerning tolerances*

Fig. 2
balanced, ungrounded, transformerless input. Condensers must be inserted into the circuit and provision made for polarization resistors.



** recommended values: C: 100µF, 63V; R: 22kΩ, 1%*

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Phantom powering to standard DIN EN 61938

Correct powering is essential. There have been various myths and misunderstandings about it. Authoritative information is contained in the standards documents, but few people have access to them which is why we are offering this detailed explanation.

Phantom powering is designed to be "invisible" and harmless to balanced microphones which were not specifically designed to use it; this includes most balanced, professional dynamic and ribbon microphones, as well as condenser microphones that use vacuum-tube circuitry. Exceptions are quite rare. The only likely cases in which standard phantom powering will endanger a balanced microphone (e.g. a ribbon) are if a microphone cable, connector or adapter is defective or wired in a non-standard way, such that one modulation lead of the microphone is shorted to ground at DC while the powering is on. If a microphone is connected to such a cable with the powering turned on, impulse current will flow through its coil or ribbon, possibly causing damage.

Fig. 1 shows the only valid 48 V and 12 V phantom powering circuit (abbreviations: P48 and P12) that can be realized with resistors as opposed to a center-tapped input transformer. This illustration is based on the international standard document EN 61938 of 1997.

The permissible tolerance of the feed resistor values as such is ±20%. However, the difference between the resistors of any one pair should be less than 0.4% (i.e. 27 Ohms for 48-Volt phantom powering with 6.8 kOhm). This close matching is necessary to maintain adequate impedance balance for the sake of common mode rejection. It also avoids the flow of DC in an input transformer should one be present, which could lead to distortion or a reduced dynamic range.

A microphone designed for 48 V phantom powering could draw as much as 10 mA according to the standard; a SCHOEPS CCM will draw about 4 mA. This falls well within the limit set by the prevailing standard. There are certain commercially available power supplies, preamplifiers, and mixing desks – mostly older, but some more recent – which fail to meet this standard and hence may not be able to power SCHOEPS microphones adequately. If in doubt, equipment should be checked to verify its suitability for professional work with SCHOEPS microphones. On page 7 a method is described for checking a phantom supply quickly and easily.

For P12 the standard allows a current of 15 mA. A SCHOEPS CCM will draw 8 mA.

Fig. 2 shows a balanced but grounded amplifier input. In this case either a transformer (see fig. 1) or additional capacitors have to be inserted into the audio line.

Unbalanced Operation

Our microphones are intended for balanced operation, which is why they should be operated with balanced inputs. Otherwise the vulnerability to interference would be increased. However some equipment only has unbalanced inputs in which case an unbalanced input should be balanced with a high-quality microphone input transformer. This will allow the signal leads from the microphone to be kept balanced, for best rejection of interference.

If such an arrangement is not possible, however, a CCM microphone may be operated in unbalanced mode by taking the signal from pin 2 via a coupling condenser with a value as shown in Figure 2 above. The signal from pin 3 should be left unconnected; do not short it to ground. This "unbalancing act" must occur between the power supply and the preamplifier input, however, since naturally all three pins of the microphone must still connect to its phantom or parallel power supply.

Simultaneous Connection to Multiple Inputs

If a microphone has to be connected to multiple inputs simultaneously, an active microphone splitter should be used in order to preserve the loading and powering conditions for the microphone, and to prevent interference.

Maximum Cable Length

Cable lengths of up to 300 meters are possible, but the practical limit depends on the electrical

capacitance of the cable, which is sometimes an unknown quantity. The lower this capacitance is per unit length, the longer the cable can be. All SCHOEPS cables have very low capacitance (100 pF/m between the conductors).

The main risks with excessively long microphone cables are gradual losses at high frequencies due to the cable capacitance, some reduction in ability to handle very high sound pressure levels, and increased pickup of interference.

Hints on Avoiding Interference

SCHOEPS CCM microphone are virtually immune to magnetic, electric and electromagnetic fields.

Due to the wide dynamic range of studio microphones, the smallest signal amplitudes are in the microvolt range (1/1,000,000 Volt). Cable shielding and the grounding scheme of the preamp or mixer input are also crucial. A microphone can therefore never be expected to be immune to all possible disturbances in all circumstances, but the following suggestions can help to reduce possible noise induction:

1) Keep both the microphone and the cable away from sources of interference such as monitors, digital equipment (computers), RF emitters (mobile phones and other personal communication devices that emit radio frequency energy), power transformers, power lines, SCR dimmers, switching power supplies etc.
2) Use only high-quality cables with a high degree of shield coverage.
3) Keep all cables as short as possible.
4) Dress audio cables away from power cables. If they must cross, it should be at right angles.
5) At the preamp or mixer input, the shield of the microphone cable should connect to chassis ground in the shortest way possible. If necessary, this coupling can be capacitive.

Technical Specifications:

Current consumption:	P12: 8 mA, P48: 4 mA; (automatically switched)
Source impedance:	90 Ohms
Minimum recommended load impedance:	600 Ohms
Low-cut frequency (-3 dB):	20 Hz
Polarity:	increasing sound pressure on the microphone's 0° axis produces a positive-going voltage at pin 2. voltage at pin 2.
Maximum output voltage:	ca. 1 V
Acoustical specifications can be found on page 19.	
Length U-version:	46 mm – 58 mm, type-dependent
Length L-version:	46mm – 58mm without connector
Diameter:	20 mm
Weight without cable:	U-version: 33 g, L-version: 43 g
Surface finish:	matt gray (g) or nickel (ni)
Standard length of the cable:	5 m

Pin assignment of the XLR-3M output connector of CCM microphone amplifiers:

Pin 1: screen (GND)
Pin 2: +phase
Pin 3: –phase

Bottom view
(as the pins are seen)

+Phase: an excursion of the diaphragm towards the back electrode (positive pressure phase) leads to a positive signal at this pin

*Matched (i.e. matching tolerance of only 0.7%), see page 5

** Here are two simple methods for verifying correct phantom powering. These measurements should be made at an unused input. Reduce the channel gain to the minimum to protect the loudspeakers, etc. If microphones are connected to other inputs at the same time, no substantial difference should occur in the results.

1. Measure the open-circuit voltage between ground (pin 1) and either pin 2 or pin 3 of the XLR input. Given the permitted tolerances, this voltage should be between 44 and 52 VDC for P48, and between 11 and 13 VDC for P12. Then, measure the short-circuit current between ground (pin 1) and either pin 2 or pin 3 of the XLR input. Given the permitted tolerances, this current should be between 5.9 and 8.5 mA DC for P48, and between 15 and 21 mA DC for P12.
Note: Well-designed phantom power supplies must tolerate at least a temporary short circuit without damage; an unbalanced connection (which is occasionally necessary) would cause the same current to be drawn. To be safe, however, do not leave the short circuit in place longer than necessary.
2) Measure the DC voltages on the modulation leads with a microphone connected, e.g. by opening the connector shell of the cable. The two voltages (from pin 2 and pin 3 to pin 1) must be identical. They should be about 34 Volts (minimum = 30 Volts). For P12 this is 8.3 Volts (minimum 7.3 Volts).

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Which is the best microphone for ... ?

In our opinion a good microphone ought to sound natural, just as you would expect a good audio amplifier to sound; it should therefore be suitable for any instrument. This requires flat frequency response and a directional characteristic independent of frequency. There will be no difference in sound quality whether the pickup is on- or off-axis.

Obviously this ideal can only be achieved to a finite degree. With directional microphones, proximity effect causes the low-frequency response to vary significantly while with nearly all microphones (especially omnidirectional microphones), the polar pattern is rarely ideal at the highest frequencies.

Only in rare cases can "the" correct microphone be chosen unequivocally, since – based on experience – aspects of taste, recording location, position of sound sources and the microphone, and the atmosphere of the music or other program material must also be considered. Any absolute recommendations would therefore be of limited value at best. However, we would like to offer some ideas that offer a good place to start.

Our Recommendations

The microphone type that comes closest to the theoretical ideal is the classic pressure transducer. It has an omnidirectional pickup pattern, reproduces even the lowest audio frequencies with full sensitivity, and has no proximity effect.

The most commonly used pattern for medium-distance pickup is the cardioid (CCM 4 or CCM 4V). However, there may be good reasons to make a different choice. Some examples:

– increased directivity may be required, either for the sake of a "drier" recording or for suppressing sound from adjacent instruments. In this case we recommend the supercardioid CCM 41 or shotgun microphone CMIT 5 U, as long as no nearby sound source or P.A. loudspeaker is directly behind the microphone, since it has a rear lobe.
– for a broader pickup pattern, with very natural sound quality for sound arriving at the sides of the microphone and more extended low-frequency response, we recommend the CCM 21 wide cardioid.
– for a very natural sound character and a pickup pattern close to a cardioid: CCM 22 Open Cardioid
– for essentially perfect pickup of low-frequency information and room sound, we recommend the omnidirectional CCM 2H or CCM 2S.
– when using directional microphones with very close placement, proximity effect must be compensated for with a bass rolloff. This is especially true when miking instruments. For voice, try the CCM 4P or CCM 4VXP. For instruments the omnidirectional CCM 2 may be of interest (no proximity effect, low sensitivity to "popping" or solid-borne noise).
– for very distant miking with essentially perfect bass response and/or as an "ambience" microphone: omni CCM 2XS.
– for outdoor recording if directivity is not required (e.g. close miking), the omni CCM 2S + windscreen W 5 or W 5 D will offer low sensitivity to wind, "popping" and handling noise.
If high directivity is required outdoors, the CCM 41 can be used with the W 5 D, WSR 100 or WSR MS LI "basket"-type windscreens with built-in elastic suspension for mono or stereo.

All SCHOEPS microphones, even switchable ones, are single-diaphragm electrostatic transducers. They fall into two general categories: pressure transducers and pressure-gradient transducers. Many of our microphones combine the two principles of operation in various proportions, yielding patterns from wide cardioid to supercardioid. While not strictly correct, these microphones are classed as pressure-gradient transducers by convention.

Unlike dual-membrane microphones, our switchable microphones offer flat low-frequency response, low sensitivity to wind and solid-borne noise, and no proximity effect in their omnidirectional settings. In their cardioid settings they maintain their directional pattern to the lowest frequencies, which dual-diaphragm microphones do not.

The following table lists the basic characteristics of these two general types.

Characteristics of the Two Basic Transducer Types

	Pressure Transducers (omnis)	*Pressure-Gradient Transducers*
Frequency response:	Essentially flat, with accurate reproduction of the lowest frequencies. The on-axis response of the free-field microphone does not have a high-frequency emphasis, but that meant for the reverberant sound field does.	Reduced sensitivity (rolloff) at lower frequencies, which can be compensated by close placement to the sound source (proximity effect)
Directional pattern:	Omnidirectional pattern in its ideal form only at low and middle frequencies. At very high frequencies there is increasing directivity. For this reason even omnidirectional microphones are directed towards the sound source.	Types: wide cardioid, Open Cardioid, cardioid, supercardioid (hypercardioid), bidirectional (figure-8). The frequency response of our figure-8 is nearly the same in all directions; the wide cardioid microphone also offers this advantage.
Proximity effect:	None	Elevation of low frequencies as working distance decreases in near-field use (quite noticeable at under 50 cm)
Sensitivity to vibration, wind and popping:	Very little; simple foam-type windscreens often offer good protection.	Considerable; shock mounting and larger, more elaborately constructed windscreens may be needed.

	Appliations:	Recommendations:
Speech / Speakers / Vocals	On a lectern	CCM 4 (cardioid) with close-speech guard B 5 D
	Conference recording	CCM 4 (cardioid) with close-speech guard B 5 D; for close pickup < 20 cm: cardioid with bass rolloff CCM 4P; for close pickup < 10 cm: cardioid with bass rolloff CCM 4XP
	TV speaker's table	CCM 4 (cardioid) without pop filter at a distance exceeding 40 cm
	Broadcast studio	CCM 4 with PR 120 SV pop filter; SCHOEPS V4 U
	TV "round table" discussion	CCM 4 (cardioid) or SCHOEPS boundary-layer microphone BL CCM 3
	Church	CCM 4 (cardioid), possibly using boundary-layer technique with BLCg
	Stage	CCM 4 (cardioid) or CCM 41 (supercardioid) with BLCg
	Stage (movable)	CCM 4 (cardioid) or CCM 41 (supercardioid)
	Stage (fixed)	CCM 4 (cardioid) on an RL tube with B 5 D windscreen
	News reporting	CCM 5 (omni/ cardioid, switchable); use the omni setting if there is strong wind and/ or when there is no disturbing ambient noise; windscreens: B 5 D, W 5 D or W 20 R1
	Film and video dialog/effects	CCM 41 with B 5 D close-speech guard
	Studio	CCM 4, CCM 4V (cardioids), CCM 22 (Open Cardioid) with pop filter
Instruments	All instr. incl. percussion	CCM 4 (cardioid); to pick up room sound as well – especialy with an organ: CCM 2S (omni) or – when the room's character is less than optimal or if the bass is too strong: CCM 21 (wide cardioid)
	Tympani, bass drum, etc.	pressure transducer, e.g. CCM 2 (omni)
	Instruments with adapters	violin: CCM 4/ CCM 4V (cardioid), saxophone: CCM 4 (cardioid)
	Spot mike in an orchestra	CCM 4 (cardioid), CCM 41 (supercardioid), but also CCM 21 (wide cardioid) or CCM 22 (Open Cardioid), all with an RL tube
Stereo	Orchestra, chorus	ORTF with 2× CCM 4 and bracket STC 4; A/B recording, e.g. with CCM 2S , M/S with CCM 4/ CCM 21 (cardioid/ wide cardioid) and CCM 8 (figure-8); Decca-Tree with 3× CCM 2H, perhaps using KA 40 accessory spheres
	Small orchestra / ensemble	boundary-layer technique, ORTF or X/Y with M 100 C stereo bracket
	Film and video dialog/effects	M/S with CCM 41 (supercardioid) in the M-channel and CCM 8 (figure-8) or with a CMIT and a CCM 8
Surround	Orchestra	OCT surround; Decca Tree with 5× CCM 2H, perhaps using KA 40 accessory spheres; near-coincident placement with 5× CCM 21 (wide cardioid) or CCM 4 (cardioid)/ CCM 22 (Open Cardioid), Hamasaki Square with 4× CCM 8 (figure-8)
	Film and video dialog/effects	Double M/S



CCM 2



CCM 2H



CCM 2S

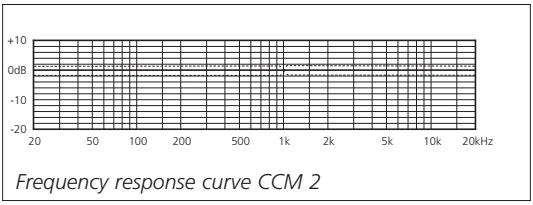


CCM 2XS

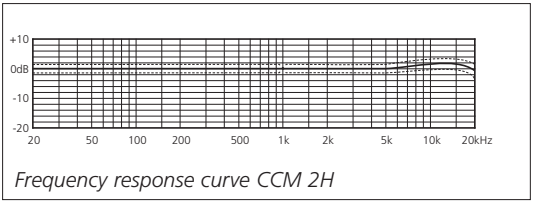
CCM 2 for free-field placement (close to the sound source)
CCM 2H for use at moderate distance (at or near the reverberation radius*)
CCM 2S all-purpose microphone for music and speech, also for use at moderate distance
CCM 2XS for diffuse-field placement (well beyond the reverberation radius*)

The actual miking distances which correspond to these categories will depend greatly on characteristics of the recording environment, especially on its size and reverberance. Each of these microphones, when used at appropriate distance, will have a well-balanced overall response given the mixture of direct and reflected sound energy typical of that distance.
Note: Since the microphones have some directionality at high frequencies, it is still necessary to aim them at the sound source."

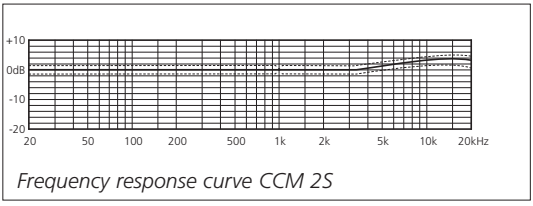
Uses:
CCM 2: relatively close miking of instruments, vocalists, etc.
CCM 2H, 2S, XS: "spaced microphone" stereo pickup and "Decca Tree" arrangements
CCM 2XS: as CCM 2H; room microphone



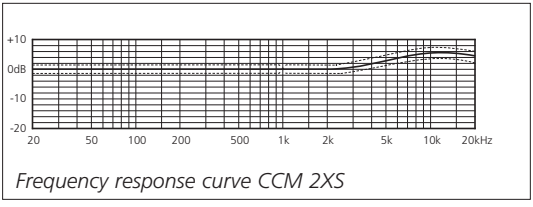
Frequency response curve CCM 2



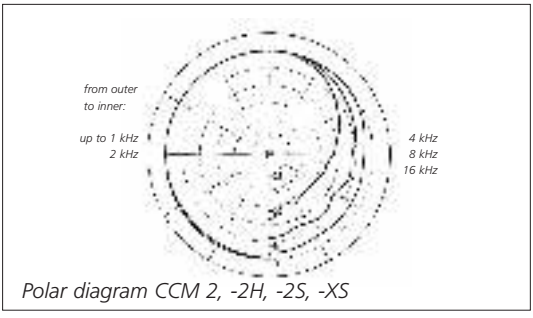
Frequency response curve CCM 2H



Frequency response curve CCM 2S



Frequency response curve CCM 2XS



Polar diagram CCM 2, -2H, -2S, -XS

*reverberation radius: the distance from the sound source at which the levels of direct and diffuse sound are equal.

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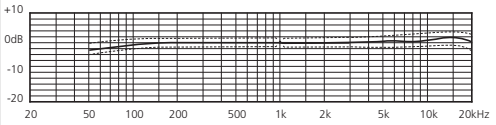




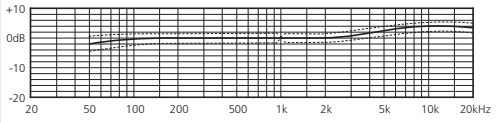
CCM 21 CCM 21H

– wide cardioids
– polar pattern very well maintained throughout the frequency range
– a favorable compromise between omni (good low-frequency response) and cardioid (consistent directional pattern at all frequencies)

Uses:
CCM 21: often preferred for use as a spot microphone, or as the main pair for overall stereo pickup
CCM 21H: often preferred for use when recording vocals, acoustic guitar or percussion



Frequency response curve CCM 21



Frequency response curve CCM 21H



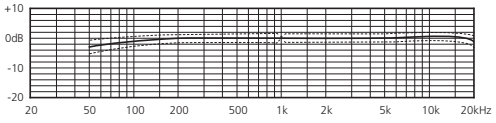
Polar diagram CCM 21, -21H



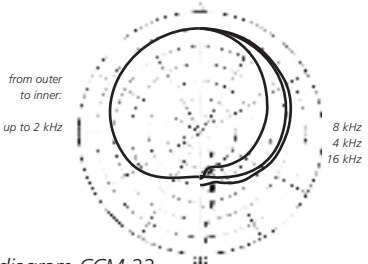
CCM 22

– "Open Cardioid"
– optimal combination of classic cardioid directionality (CCM 4) with the sonic character of the wide cardioid (CCM 21)
– directional pattern largely constant throughout the frequency range

Uses:
for spot miking and as a soloist's microphone



Frequency response curve CCM 22



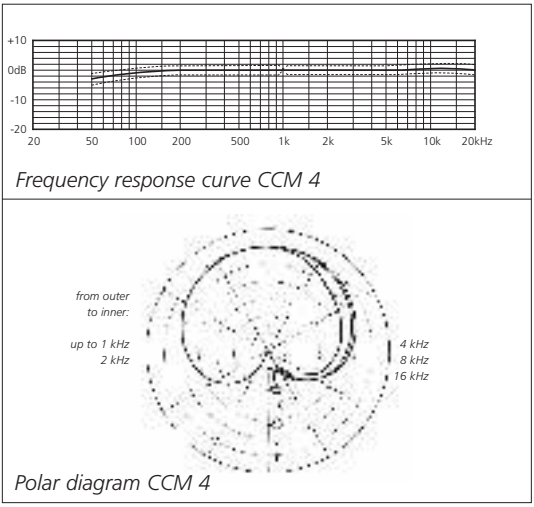
Polar diagram CCM 22



CCM 4

– standard cardioid with clear sound quality, free of coloration
– all-purpose microphone for music and speech
– highly consistent frequency response
– our best-selling compact microphone type
– cardioid pattern is maintained even at low frequencies
– 0° axis is at the tip of the microphone

Uses: often preferred for singing or speaking voices and most instruments; as a spot microphone for X/Y, ORTF and M/S stereo recording



Frequency response curve CCM 4

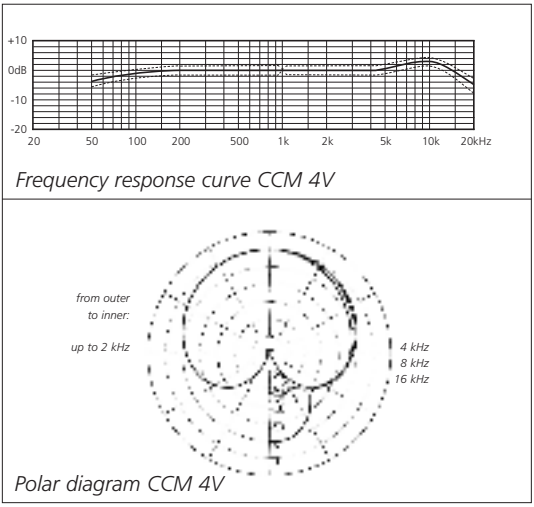
Polar diagram CCM 4



CCM 4V

– cardioid with mild high-frequency boost
– all-purpose microphone for music and speech
– highly consistent polar response: cardioid pattern is maintained at low and high frequencies
– 0° axis is at the side of the microphone marked by a red dot

Uses: often preferred for singing or speaking voices and most instruments; as a spot microphone for X/Y, ORTF and M/S stereo recording



Frequency response curve CCM 4V

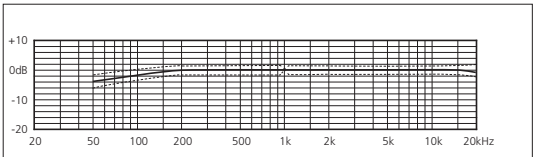
Polar diagram CCM 4V



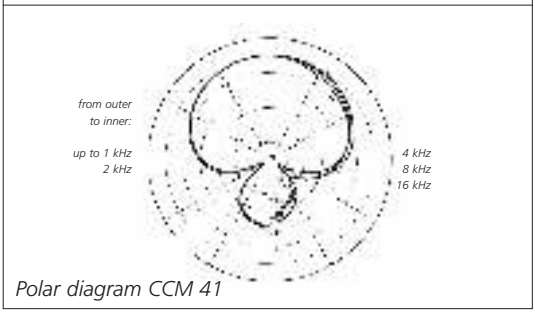
CCM 41

– all-purpose microphone for speech and music recording of all kinds
– well suited for use as the main microphones for stereo pickup and/or as "spot" microphones
– extended, smooth, well-balanced frequency response
– often used for film and video sound
– where it can be used, it has distinct sonic and practical advantages over most shotgun microphones
– highly consistent polar response
– 0° axis is at the microphone's tip

Uses: often preferred for use in film sound recording and as a spot microphone in orchestras



Frequency response curve CCM 41



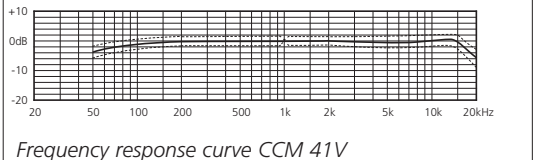
Polar diagram CCM 41



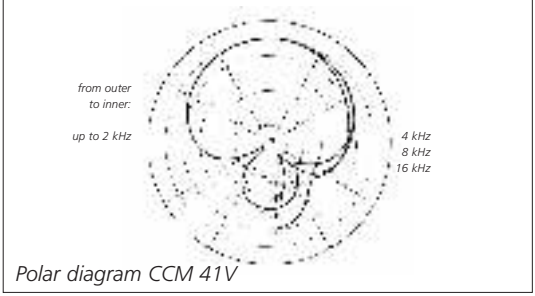
CCM 41V

– all-purpose microphone for music and speech; same uses and advantages as the CCM 41
– lateral pickup

Uses: often preferred for use in music and speech recording, as a spot microphone and also as a main microphone, especially when using the OCT recording method



Frequency response curve CCM 41V



Polar diagram CCM 41V

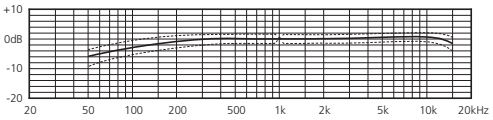
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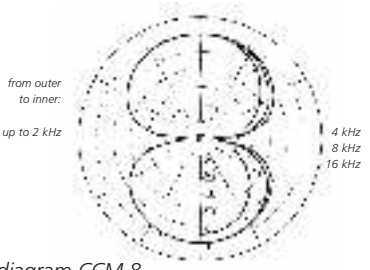
CCM 8

– figure-8 ("bidirectional") pattern
– clear sound quality, free of coloration
– microphone for M/S and Blumlein stereo
– highly consistent frequency and polar response
– response essentially free of off-axis peaks like a good ribbon microphone (but not as delicate physically)
– lateral pickup

Uses: optimal for M/S and Blumlein stereo recording



Frequency response curve CCM 8



Polar diagram CCM 8

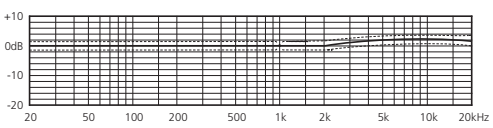
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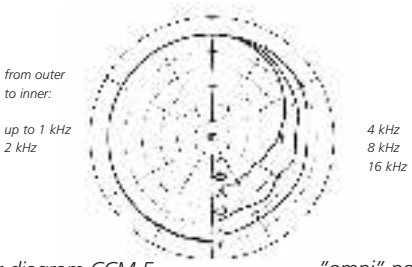
CCM 5

– mechanically switchable single-diaphragm microphone (omni/ cardioid)
– smoother, more extended high-frequency response than most other multi-pattern microphones (e.g. dual-diaphragm microphones of other manufacturers)
– slightly brighter than the CCM 2H (omni) or CCM 4 (cardioid)
– a pure pressure transducer when in the "omni" setting (flat, extended low-frequency response without proximity effect or undue sensitivity to wind or solid-borne sound)

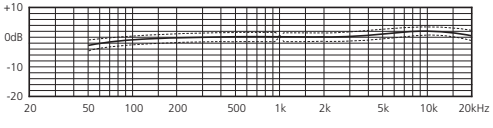
Uses:
preferred uses similar to those of the CCM 2 or CCM 2S and the CCM 4:
In the cardioid setting: for use with singing or speaking voices or most instruments, as a spot microphone, and for stereo recording with coincident, ORTF or M/S microphone arrangements.
In the omnidirectional setting: for recording instruments, singers, etc. at relatively close range



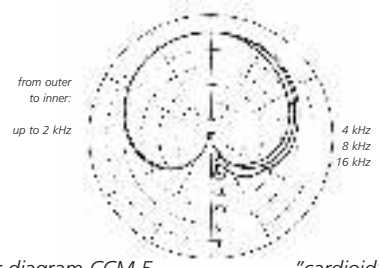
Frequency response curve CCM 5 "omni" position



Polar diagram CCM 5 *"omni" position*



Frequency response curve CCM 5 "cardioid" position



Polar diagram CCM 5 *"cardioid" position*

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CCM 4P



CCM 4VP

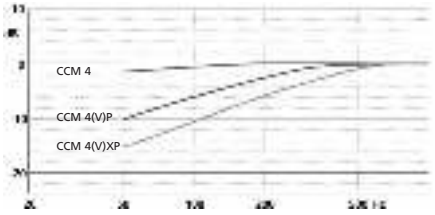


CCM 4XP



CCM 4VXP

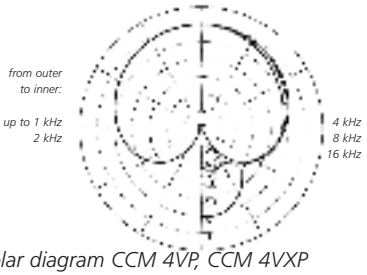
These microphones are tailored for people speaking in loud environments, an application primarily all about speech intelligibility. They are therefore used in close proximity and lower frequencies are attenuated. This enables environmental noises to be faded out and compensates for the "proximity effect", avoiding the voice having a booming, artificial quality which would be tiring and reduce speech intelligibility.



Low-frequency response curves of the two microphone types (P and XP) compared to the standard CCM 4 (measured at a 60 cm equivalent distance).



Polar diagram CCM 4P, CCM 4XP



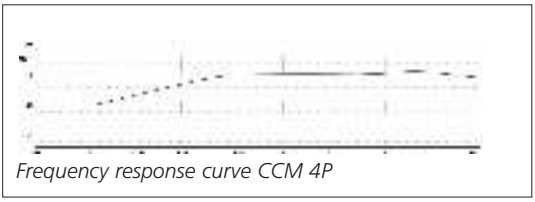
Polar diagram CCM 4VP, CCM 4VXP

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CCM 4P

– cardioid pattern
– for pickup of speech or music at close range (under 20 cm)
– moderate attenuation of low frequencies

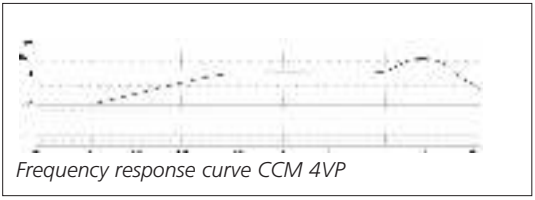


Frequency response curve CCM 4P



CCM 4VP

– cardioid pattern, side-adressed
– for pickup of speech or music at close range (under 20 cm), otherwise the sound may become "thin"
– moderate low frequency attenuation

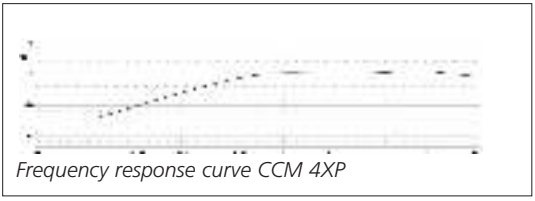


Frequency response curve CCM 4VP



CCM 4XP

– cardioid pattern
– for pickup of speech or music at close range (under 10cm)
– considerable attenuation of low frequencies

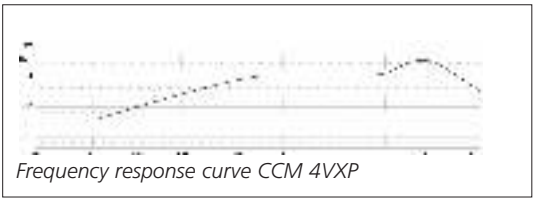


Frequency response curve CCM 4XP



CCM 4VXP

– cardioid for lateral pickup
– for pick up of speech or music at close range (under 10 cm)
– considerable attenuation of low frequencies



Frequency response curve CCM 4VXP

microphone type	polar pattern	frequency range	sensitivity	equivalent noise level CCIR	equivalent noise level A-weighted	signal-to-noise ratio A-weighted	max. SPL (0,5%THD)
CCM 2	omni	20 Hz – 20 kHz	16 mV/Pa	23 dB	11 dB	83 dB	130 dB
CCM 2H	omni	20 Hz – 20 kHz	15 mV/Pa	23 dB	11 dB	83 dB	130 dB
CCM 2S	omni	20 Hz – 20 kHz	12 mV/Pa	24 dB	12 dB	82 dB	132 dB
CCM 2XS	omni	20 Hz – 20 kHz	10 mV/Pa	26 dB	14 dB	80 dB	134 dB
CCM 21	wide cardioid	30 Hz – 20 kHz	13 mV/Pa	24 dB	14 dB	80 dB	132 dB
CCM 21H	wide cardioid	30 Hz – 20 kHz	10 mV/Pa	26 dB	16 dB	78 dB	134 dB
CCM 22	Open Cardioid	40 Hz – 20 kHz	14 mV/Pa	23 dB	14 dB	80 dB	131 dB
CCM 4	cardioid	40 Hz – 20 kHz	13 mV/Pa	24 dB	15 dB	79 dB	132 dB
CCM 4V	cardioid	40 Hz – 20 kHz	13 mV/Pa	24 dB	14 dB	80 dB	132 dB
CCM 41	supercardioid	40 Hz – 20 kHz	14 mV/Pa	24 dB	15 dB	79 dB	132 dB
CCM 41V	supercardioid	40 Hz – 20 kHz	14mV/Pa	23 dB	14 dB	80 dB	132 dB
CCM 8	figure-8	40 Hz – 16 kHz	10 mV/Pa	26 dB	18 dB	76 dB	134 dB
CCM 5	omni	20 Hz – 20 kHz	10 mV/Pa	26 dB	14 dB	80 dB	133 dB
	cardioid	40 Hz – 20 kHz	13 mV/Pa	24 dB	15 dB	79 dB	132 dB
CCM 4P	cardioid	close pickup	13 mV/Pa	24 dB	15 dB	79 dB	132 dB
CCM 4VP	cardioid	close pickup	13 mV/Pa	24 dB	15 dB	79 dB	132 dB
CCM 4XP	cardioid	close pickup	12 mV/Pa	25 dB	15 dB	79 dB	132 dB
CCM 4VXP	cardioid	close pickup	10 mV/Pa	25 dB	14 dB	80 dB	134 dB

A note about signal-to-noise specifications for studio microphones. The standard method, which SCHOEPS follows, is really just an alternate way of stating a microphone's equivalent noise level. It is designed to allow comparison of noise floor levels for different microphones. Unlike the signal-to-noise specifications for other types of audio equipment, which give the ratio of a component's clipping point to its noise floor, these values do not indicate a microphone's entire available dynamic range. Instead, the values are measured with reference to a standard sound pressure level of 1 Pascal (1 Pa = 94 dB SPL). But the actual maximum SPL capability of any usable microphone exceeds that reference level substantially. The signal-to-noise specifications of our microphones would be 35 to 40 dB greater if the "hi-fi" approach were used.

The use of "A" weighting when specifying the equivalent noise level of microphones is another frequently misunderstood aspect of the standards. "A" weighting yields a distinctly lower noise specification – mostly by 10 dB or more – and this figure, of course, becomes the one most often cited in advertising. In practice, however, the CCIR weighted noise level may well be a more accurate indicator of a microphone's perceived noise level.

Care of Compact Condenser Microphones

Please take care to avoid placing microphones in a dusty environment. Keep them in their cases (e.g. the wood carrying case they come with) when not in use, since any dust that gets inside the capsules can adversely affect their functioning. Dust can affect the microphones in the following way: In combination with humidity it can lead to condensation and thus popping and crackling noises (often described as "frying sounds").

What to do if ...
the microphone is noisy (clicks and pops) in high humidity?

If the microphone is brought in from the cold outdoors to a warm (and humid) environment, snapping or clicking noises can result from the condensation of moisture.
In this event the microphone should be given between 30 and 60 minutes to warm up, and will then generally perform flawlessly.

If this treatment does not eliminate the noise, it is possible that dirt has gotten inside the transducer (capsule) itself – in which case the microphone must be sent back to the factory for cleaning. We strongly advise customers not to open a microphone or attempt to clean it themselves. Doing so would also invalidate all warranties.

Windscreens are recommended when microphones have to be used in dirty or dusty environments in order to avoid problems of the kind described above.

Troubleshooting

Wind noise and polar pattern
Noise problems can be taken into account when choosing a microphone pattern (directional characteristic) for a given set of recording conditions. Pressure transducers are considerably less prone to picking up noise from air currents or mechanical vibration than pressure-gradient transducers (such as cardioids or supercardioids).

SCHOEPS omnidirectional microphones are pressure transducers, as is our switchable-pattern compact microphone CCM 5 in its omnidirectional setting. If strong wind or physical vibration of the microphone is anticipated, a pressure transducer such as the CCM 2 S should be used instead of a cardioid or supercardioid. The distance between the microphone and the sound source should then be halved if possible.

Wind noise and windscreens
Air motion (wind, vocal "popping" on sung or spoken consonants, motion of the microphone on a boom arm, or air currents due to heating or air conditioning systems) can cause noise that should always be dealt with. Even if it doesn't cause overload, it will detract from the clarity of sound. A wind or pop screen should be used, but should be chosen carefully to avoid changing the microphone's characteristics too much. Many screen types which are effective at reducing wind noise also have a tendency to reduce a microphone's directionality and/or its high-frequency response. Basket-type windscreens mainly cause some unevenness in the frequency response (see our general catalog for details).

Vibration
If noise from mechanical vibration enters a stand- or boom-mounted microphone, a shock mount (elastic suspension) should be used, and a loop of slack cable isolated and tied off so that it does not become another way for vibrations to reach the microphone. Unlike a wind screen, a shock mount will not affect the characteristics of a microphone. In many kinds of work it is well justified to use a shock mount "by default."

Overload
If transient or continual overload occurs, or seems likely to occur, it is useful to think of the complete set of equipment used for a recording or broadcast as a succession of "stages." The signal should then be attenuated (its level decreased) at the input to the first stage of equipment which might be overloaded.

A condenser microphone itself represents at

least two stages – the capsule and the amplifier. The only sound pressure that could overload a SCHOEPS microphone capsule (150+ dB SPL) would also damage human hearing almost instantly; in practice our capsules are rarely overloaded except by explosions or direct exposure to strong wind. As a rule such overload will not damage the microphone; even strong wind blowing directly against the capsule membrane will not harm it unless the forces involved are rather enormous.

The input of the amplifier stage of a SCHOEPS CCM microphone can be overloaded, but only by sound pressure levels in excess of 130 dB.

With a properly powered SCHOEPS microphone that is not being exposed to wind, any overloads will occur far more often in a mixer or preamp's input circuit than in the microphone itself. This is particularly true with equipment that was designed primarily for use with dynamic or consumer-type microphones. Thus if distortion is heard when wind, etc. is not the obvious cause, one of the first tests might be to plug in a balanced "pad" (resistive attenuator such as the SCHOEPS MDZ 10 or MDZ 20) at the console or preamp input to see whether that solves the problem. This type of pad is superior to built-in pad switches.

Unfortunately, even with fully professional equipment, "overload" indicators cannot always be relied upon to indicate input overload – many such indicators are wired only to later stages in the circuitry.

If a preamp or mixer has an input sensitivity control, it should be set for a good compromise between avoiding input overload on the one hand (sensitivity too high) and avoiding noise on the other (sensitivity too low). Ideally a mixer or preamp should not add any noise of its own to a microphone's signals, but a dB or two of hiss is better than gross distortion caused by clipping.

Low-frequency disturbances such as wind or vibration may not be perceived directly (subsonic noise), but can still cause overload in some stage of the signal chain. Low-frequency noise can be effectively suppressed with the Active in-line low-cut Filters LC 60 and LC 120. They can be placed between the output of the microphone cable and the phantom-powered input of a mixer, preamp or recorder, thus protecting that input from overload.

Overload which does not otherwise seem to make sense may actually be a symptom of incorrect or inadequate microphone powering. Powering systems and their requirements are discussed near the beginning of this User Guide on page 5.

The most appropriate and most helpful troubleshooting tools are:

- a well-known good microphone cable
- a simple pop screen such as the SCHOEPS B 5 (or for outdoor recording, a wind screen such as the SCHOEPS W 5)
- a balanced, in-line resistive attenuator ("pad") such as the SCHOEPS MDZ 10 or MDZ 20
- an ordinary multimeter

Warranty

We guarantee our products for a period of twenty-four months, excluding batteries. The guarantee period begins on the date of purchase.

Please provide your bill of sale in all cases as proof of guarantee; without it, repairs will be undertaken only at the owner's expense. We reserve the right to satisfy all warranty requirements regarding defects of workmanship or materials by means of repair or partial or complete replacement of the product, at our sole discretion.

Excluded from this guarantee are defects due to misuse (e.g. incorrect operation; mechanical damage), abuse or "acts of God." This guarantee is nullified in the event of tampering by unauthorized persons or agencies.

To secure your rights under this guarantee, send the product with proof of purchase and a precise description of the malfunction, at your expense, either to SCHOEPS (if you are a customer in Germany), or to our representative (if you are a customer outside Germany).

Prior to sending your defective product for repair, please contact your local dealer or distributor for instructions. In exceptional cases you can, by prior arrangement with SCHOEPS, send the product directly to us from a foreign country. However any return shipment must then be prepaid; this tends to cause delays, especially for non-warranty service. Full payment must be made before a repaired item can be returned to the customer.

This guarantee does not affect any contractual agreements which may exist between the buyer and seller of the equipment.

This guarantee is world-wide.

Declaration of Conformity – CE-Mark

The CE-mark guarantees that all products conform to relevant standards approved by the European Community. The products described in this User Guide comply with current, relevant standards when used with cables from SCHOEPS.

Relevant directives:
EMC Directive 2014/30/EU

Relevant standards:
EN 55 103-1, -2 and those referred to by them.

Errors and omissions excepted.

160203

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