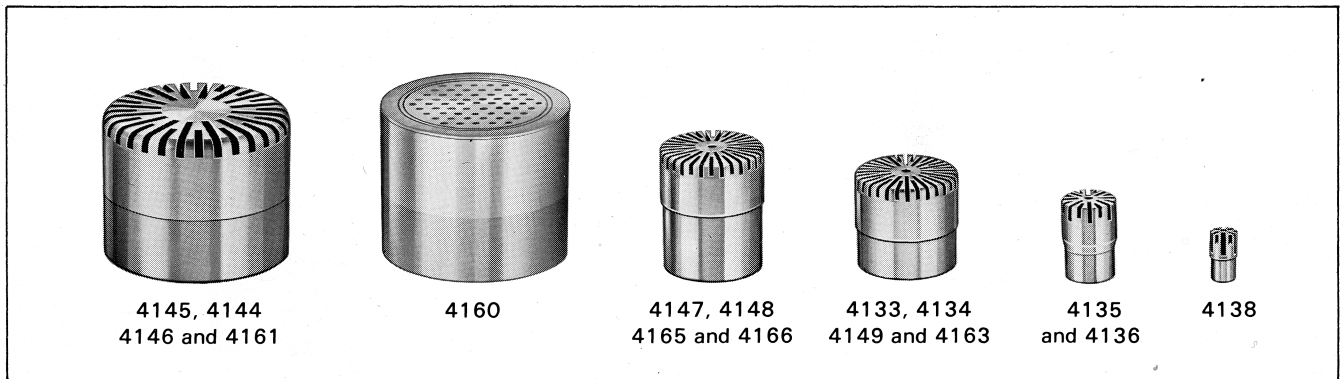


types 4133, 4134, 4135, 4136, 4138, 4144, 4145, 4146, 4147, 4148, 4149, 4160, 4161, 4163, 4165 and 4166

## Condenser Microphone Cartridges



### FEATURES:

- Frequency ranges from below 0,01 Hz to 140 kHz
- Dynamic ranges from -17 dB to 180 dB SPL
- Very wide temperature range
- High resistance to humidity
- Artificially aged for long term stability
- Flush mounted diaphragms
- Rugged constructions
- All operating characteristics well defined
- All important data individually calibrated and supplied
- Wide range of accessories

### USES:

- Precision sound measurements
- Pressure variation measurements

The B & K measuring microphones are designed for accurate sound measuring purposes. They are precision engineered from materials selected to give long term stability. Their resistance to humidity is very high, the temperature range very wide and the temperature coefficients extremely small compared to other types of condenser microphones. A rugged construction makes them easy to handle in the field. Each microphone is delivered in a protective mahogany box supplied with an individual calibration chart giving the frequency response and all data necessary for precision measurements (Fig.1).

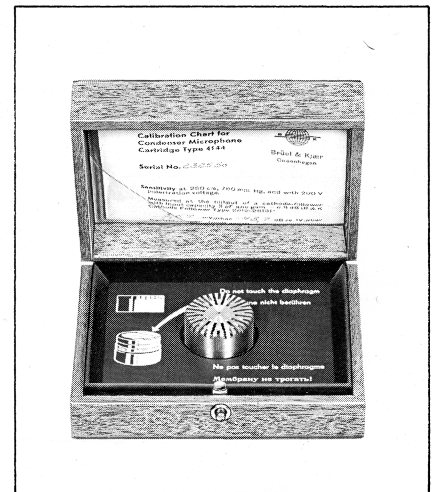


Fig.1. 1" microphone cartridge as delivered with calibration chart

plied with an individual calibration chart giving the frequency response and all data necessary for precision measurements (Fig.1).

# General Description

## Construction

The different cartridges have the same basic design (Figs.2 and 3). The smaller diameters generally provide higher limits for the frequency and dynamic ranges, at the expense of a lower sensitivity.

Fig.2. shows a sectional view of a condenser microphone cartridge. Depending on type, the insulator is made of either siliconetreated quartz or a synthetic ruby to give a well defined reference surface. The diaphragm is made of pure nickel and backplate and housing are made of high nickel alloys. This practically eliminates variations of sensitivity with temperature.

During production the microphone cartridges are subjected to a high temperature (150°C), forced aging process which ensures a long term calibration stability.

Special care has been devoted to the equalization of the static air pressure between the inside and the outside of the cartridge so as to give a well defined and low limiting frequency.

The pressure equalization arrangements used in the cartridges are shown in Figs.4 and 5. The Types 4148, 4149, 4160, 4161, 4163, 4165 and 4166 are back-vented for use with dehumidifiers, while all the other types are side-vented.

The cartridges are available with four different diameters:

1", 23,77 mm (Types 4144, 4145, 4146, 4160 and 4161)

1/2", 12,70 mm (Types 4133, 4134, 4147, 4148, 4149, 4163, 4165 and 4166)

1/4", 6,35 mm (Types 4135 and 4136)

1/8", 3,175 mm (Type 4138)

This wide range of condenser microphones is made available to cover an extensive field of applications.

\* Exactly 0,936 inch in accordance with the American Standard ANSI S1.12-1967.

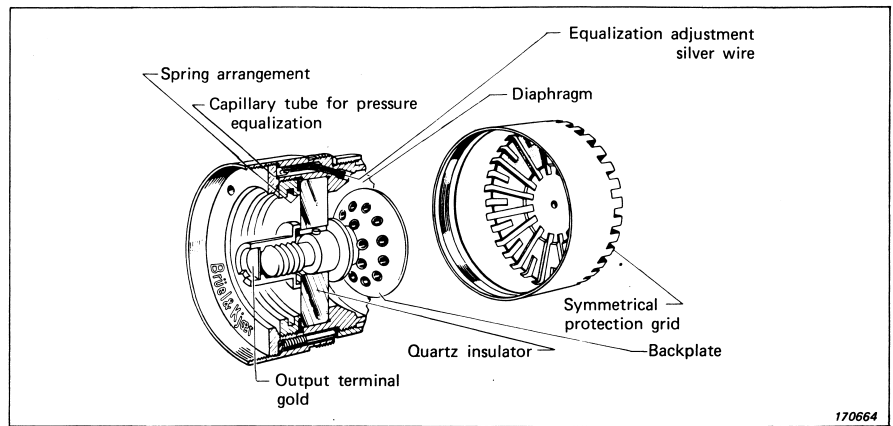


Fig.2. Sectional view of a 1" condenser microphone cartridge

The microphones 4144, 4145, 4133, 4134, 4165, 4166, 4135, 4136 and 4138 together cover the requirements to environment, frequency and dynamic ranges for most sound measurements, while the special microphones 4146, 4147, 4148, 4149, 4160, 4161 and 4163 are developed to suit particular applications.

Each size is available with either linear, 0° incidence, free-field frequency response or linear pressure response (the 1/8" Type 4138 pressure only). When using a free-field microphone it should be pointed towards the sound source, if the sound field is judged to come mainly from that direction, while a pressure microphone should be arranged so that the diaphragm is parallel to the direction of sound. In coupler measurements a pressure microphone is used. No specific orientation of the microphone in relation to the sound source is required. The smaller pressure microphones (1/2", 1/4" and 1/8" types) can be used for random incidence measurements at audio frequencies, as their frequency responses in this range are less dependent on angle of incidence. The 1" free-field microphones Types 4145 and 4161 can also be used for random measurements in the audio range, when fitted with Random Incidence Corrector UA 0055.

Two low cost microphones, Types 4117 and 4125, (not described in this leaflet) are also available. The 4117 is a 1" piezoelectric microphone designed for use on the Sound Level Meter Type 2208. The 4125 is a 1/2" condenser microphone cartridge for use on the

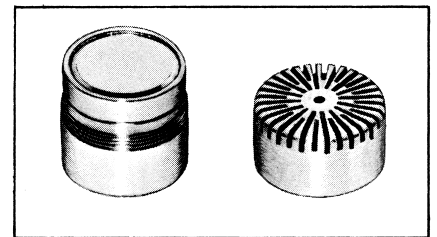


Fig.3. 1" cartridge with protecting grid removed. The diaphragm is flat and practically flush with the housing. This ensures a well defined acoustic impedance and an excellent omnidirectivity

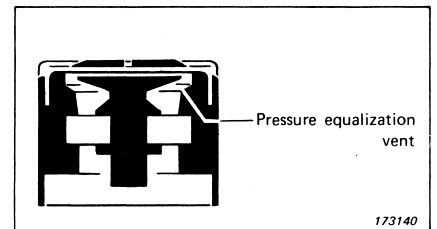


Fig.4. Side-vented microphone cartridge

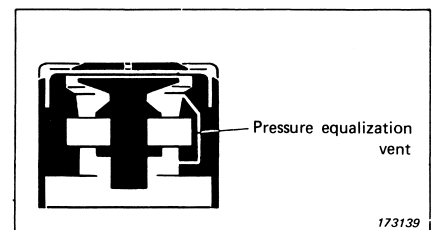


Fig.5. Back-vented microphone cartridge

Sound Level Meter Type 2219, the Noise Dose Meters Types 4424 and 4425 and with the self-contained microphone system consisting of the 1/2" Microphone Pre-amplifier Type 2642 and the battery operated two-channel Microphone Power Supply Type 2810. The 2642 may also be used with the other B & K 1/2" condenser microphones. For further information on Types 4117, 2208, 4125, 4424, 4425, 2219, 2642 and 2810, see separate product data sheets.

In the following section a short description of characteristics and application ranges of each microphone is given.

## General Purpose Types

### Free Field Response Types

**4145.** 1" diameter for general and very low sound level measurements.

**4161.** 1" diameter similar to 4145. It is furnished with backventing and is used with Dehumidifier UA 0310 for measurements in humid atmospheres.

**4133.** 1/2" diameter for general purposes, loudspeaker and microphone measurements.

**4163.** 1/2" diameter with characteristics and application ranges similar to those of 4133. It is designed with back-venting in order to be used in humid environments in conjunction with Dehumidifier UA 0308.

**4165.** 1/2" diameter for general and low level sound measurements. It has a sensitivity similar to that of a 1" cartridge and may therefore be used as a substitute for 1" cartridges in applications where these would introduce intolerable disturbance in the sound field being measured. The 4165 has a quartz covered diaphragm and is back-vented for use with the 1/2" Dehumidifier UA 0308 for measurements in humid environments.

**4135.** 1/4" diameter for general high level, high frequency measurements and model work.

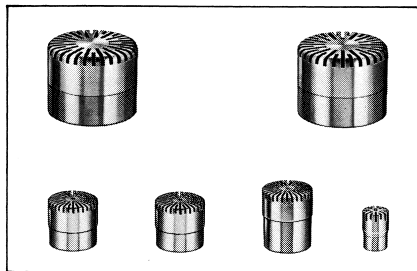


Fig. 6. Types 4145, 4161, 4133, 4163, 4165 and 4135

### Pressure Response Types

**4144.** 1" diameter used for coupler measurements, audiometer calibration, low frequency measurements and as laboratory standard.

**4134.** 1/2" diameter for medium and high level measurements in the audio range and coupler measurements. In conjunction with Probe Microphone Kit UA 0040 the 4134 can be used as probe microphone.

**4166.** 1/2" diameter for random incidence measurements. Same application range as the 4165. The 4166 has also a quartz covered diaphragm for use together with the UA 0308.

**4136.** 1/4" diameter for random incidence, coupler, high level and high frequency measurements.

**4138.** 1/8" diameter to be used for high level and very high frequency measurements, model work and as point source or point receiver.

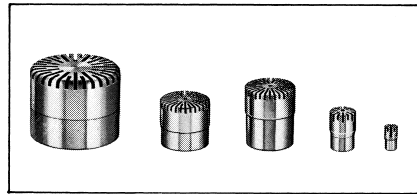


Fig. 7. Types 4144, 4134, 4166, 4136 and 4138

## Special Types

### Very Low Frequency Types

**4146.** 1" diameter. Pressure type corresponding to 4144 except that it has been sealed at the factory to give a lower limiting frequency below 0,1 Hz. A sealing kit UA 0240 is available for sealing the cartridges 4144 and 4145. The 4146 is used for very low frequency, acoustic pulse and sonic boom measurements in conjunction with the 10 MHz Microphone Carrier System Type 2631.

**4147.** 1/2" diameter. Pressure type designed with special attention to an airtight microphone housing to bring the lower limiting frequency below 0,01 Hz. It is used for ultra low frequency, acoustic pulse and sonic boom measurements in conjunction with Adaptor UA 0271 and Microphone Carrier System 2631.

### Low Polarization Voltage Type

**4148.** 1/2" diameter. Free-field type used with 28V polarization voltage for general sound level measurements with battery operated set-

ups such as Pre-amplifier Type 2619 in conjunction with Power Supply Type 2804, or with Miniature Sound Level Meters Types 2206 and 2208. 2208 requires an additional Input Stage UA 0208.

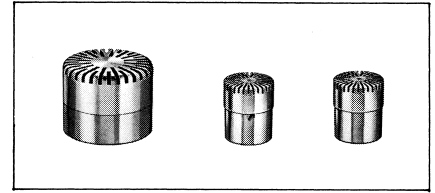


Fig. 8. Types 4146, 4147 and 4148

## Type for Humid and Corrosive Environments

**4149.** 1/2" diameter. Free-field type, similar to 4133 but with diaphragm and backplate covered with thin layers of quartz (Fig. 10), which protects against damage caused by corrosive atmospheres. It is back-vented for use with Dehumidifier UA 0308, (see section "Accessories"). The 4149 is used in noise monitoring systems such as the Type 4921, for permanent outdoor installations.

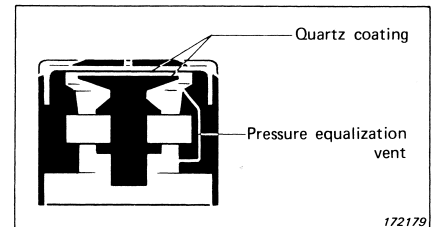


Fig. 9. Cross sectional view of the quartz-coated microphone Type 4149

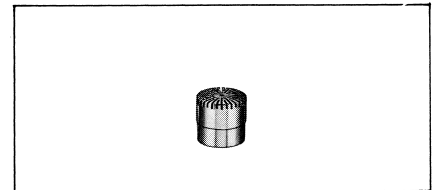


Fig. 10. Type 4149

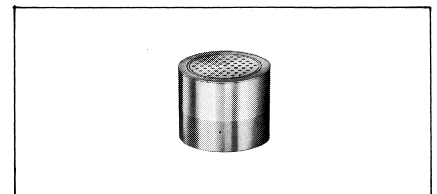


Fig. 11. Type 4160

## Western Electric WE 640 A Equivalent

**4160.** 1" diameter. Pressure type for coupler measurements and as laboratory standard. It has a linear pressure response and is equivalent

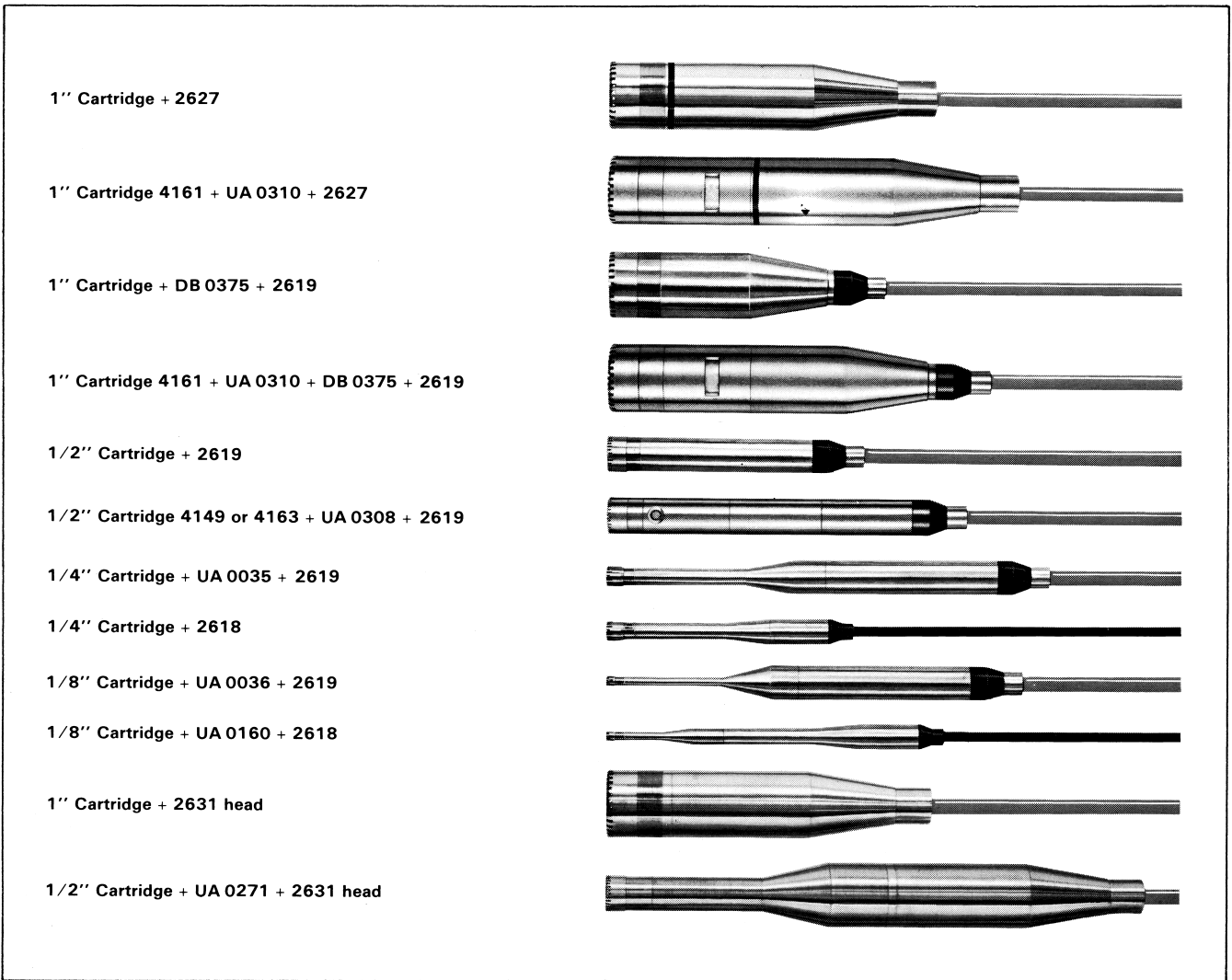


Fig.12. Mounting of the different microphones on the microphone preamplifiers and the carrier system head. Adaptor DB 0375 is included with the 2619S, whereas other adaptors should be ordered separately

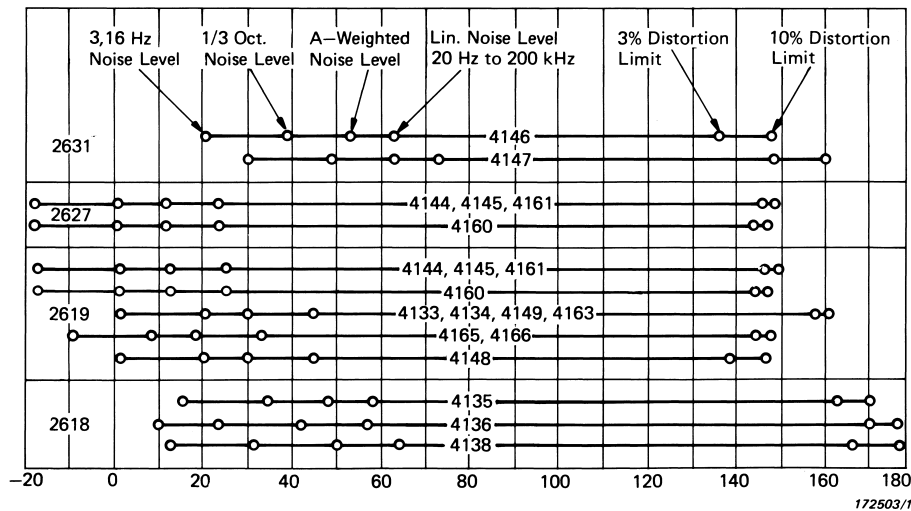


Fig.13. Dynamic ranges of B & K Microphone Preamplifiers (except 2642) and the Carrier System 2631 with different microphones. The upper limit is indicated for two degrees of distortion while the lower limit is given for various bandwidths of the measuring equipment. The limits for 3,16 Hz and 1/3 octave bandwidth is valid at 1000 Hz only

to the Western Electric condenser microphone WE 640A. The front cavity of the microphone is tested for hydrogen leakage. The 4160 is included with the Reciprocity Calibration Apparatus Type 4143.

### Preamplifiers

The microphones are designed for use with a DC polarization voltage of 200V (28V for 4148) or with a 10MHz carrier frequency. A microphone assembly will consist of a microphone cartridge and a preamplifier, when using the DC polarization voltage, and of the 10MHz Carrier Frequency System Type 2631 and a cartridge when using the carrier frequency.

The cartridges screw directly onto the preamplifier housing or the 2631 head if both have the same diameter or use is made of adaptors if the diameters differ (Fig. 12).

Three different preamplifiers are available. They all use a field effect transistor to achieve high input impedance and low inherent noise. Type 2619, 1/2" diameter is used directly with 1/2" microphone cartridges. To use 1", 1/4" and 1/8" cartridges with this preamplifier it must be fitted with the adaptors DB 0375, UA 0035 and UA 0036, respectively. The 2619 is available in two versions: 2619S, with accessories and 2619T without accessories. Type 2618, 1/4" diameter is used directly with 1/4" cartridges and with 1/8" cartridges via the adaptor UA 0160. Type 2627 is a 1" preamplifier with electrical insulation between the grounded housing of the preamplifier and the microphone cartridge. The 2627 is used primarily for calibration purposes.

Fig.13 shows the dynamic ranges of the preamplifiers and the Carrier System Type 2631, when used with the different microphone cartridges.

For further details on the Preamplifiers see separate product data sheets (2628, 2629 and 2627; 4125, 2642 and 2810; and 2631).

#### Power Supply

The stabilized polarization voltage for the cartridges (200 volt) and the power supply for the microphone preamplifier is available at the 7-pin preamplifier input socket of the B & K measuring amplifiers and fre-

quency analyzers to which the microphone assemblies can be connected directly. In this case, for switching between two microphones the Two Channel Microphone Selector Type 4408 can be used.

For operation with other equipment and for special applications the microphone assembly can be powered from the Power Supplies Type 2801, 2804 or 2807 or use can be made of the Outdoor Microphone Unit Type 4921 or the Microphone Carrier System Type 2631 (Additionally 2807 can be used for switching between two channels).

Further information can be found in section "Accessories".

The condenser microphones are also intended for use with the B & K Sound Level Meters (does not apply to Type 2219). They supply the necessary polarization voltage and preamplification (Type 2208 with Adaptor UA 0208). Furthermore they contain a measuring amplifier with indicating instrument, weighting filters and an output amplifier for driving recording instruments such as Tape Recorders Types 7003 and 7004 and Level Recorders Types 2305, 2306 and 2307.

The Precision Sound Level Meters Types 2203, 2209, and 2215 accept, with appropriate adaptors, the 1", 1/2" and 1/4" cartridges using 200V DC polarization voltage.

The Miniature Sound Level Meter Type 2206 can use the Type 4148 directly (28V DC polarization voltage), while Type 2208 can be used with this cartridge when fitted with Adaptor UA 0208. For further details see leaflets for 2206 and 2208; 2203; 2209; 2215 and 2219.

#### Assembly Response

All data given in this leaflet are open circuit, which means that the cartridges have looked into an infinitely large impedance. In practice, however, the microphone cartridges are used together with a preamplifier which will influence the response of the total microphone assembly.

The size of the influence depends on the preamplifier input impedance, the capacitance of the microphone (and adaptor), the load by extension cables connected to the preamplifier and the attenuation of the preamplifier itself. The total response of the microphone assembly is found by adding the open circuit response to the response curves given in the data sheet for the preamplifiers.

For detailed information on the response of the microphones Type 4146 and 4147 used with 10 MHz carrier frequency, see data sheet for Microphone Carrier System Type 2631.

Type No.	IEC R 123	IEC R 179	ANSI S 1.4 - 1971		
			Type 1	Type 2	Type 3
4144, 4146				F*	F
4145, 4161	F			F	F
4145, 4161 + UA 0055	F	F		F	F
4133, 4163	F	F		F	F
4134			F	F	F
4147			F	F	F
4148	F	F		F	F
4149	F	F		F	F
4135	F	F	F	F	F
4136	F		F	F	F
4138	F	F	F	F	F
4165	R	R		F	F
4166			R	R	R

\* Without protecting grid.

Fig.14. B & K Condenser Microphone Cartridges which fulfil ("F") the requirements to microphones in IEC R 123, IEC R 179 and ANSI S1.4-1971. The microphones termed "R" in the table also fulfil the standards but are specially recommended by B & K for the purposes mentioned in the standards.

# Cartridge Response

The microphone cartridges have well defined operating characteristics. Their sensitivities are high and as can be seen from Figs.15 and 16 their frequency ranges very wide.

The long term stability is extremely good. Fig.17 shows the stability as a function of temperature. The stability is of the order 1 dB per 900 years at room temperature and 1 dB per 2 hours at 150°C.

## Individual Calibration

The microphones fulfil the American standard ANSI S1.12-1967 "Specifications for Laboratory Standard Microphones" as indicated in Table 1.

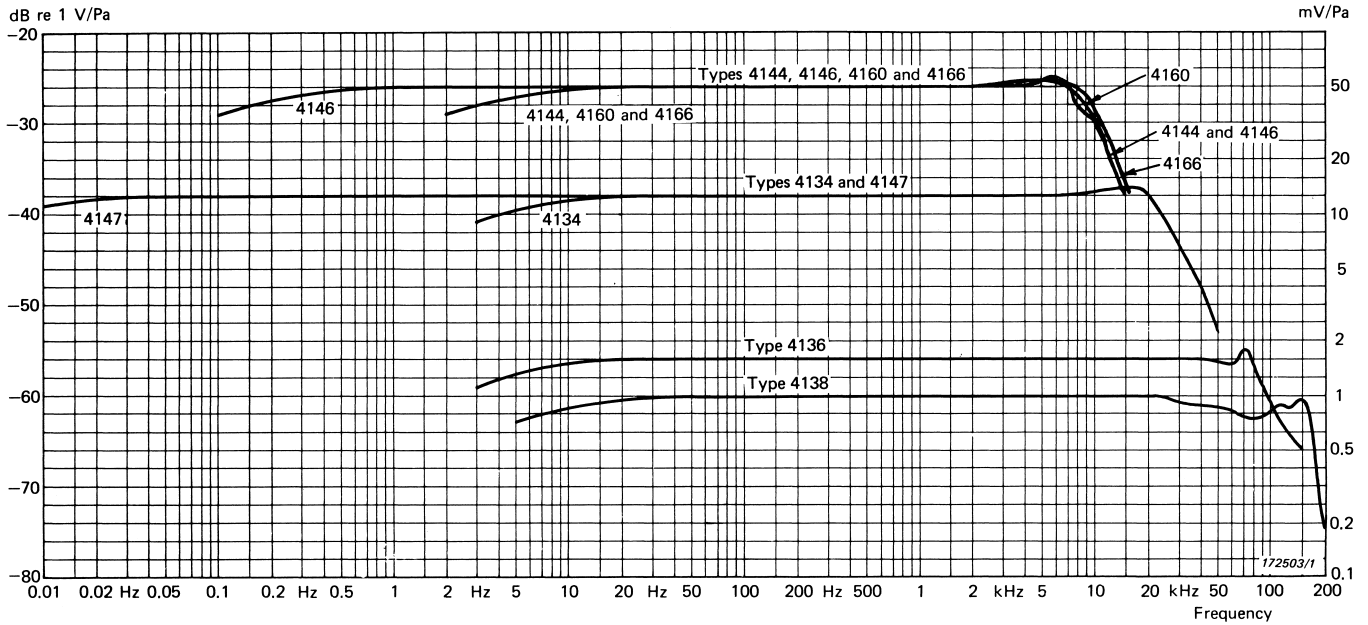


Fig.15. Typical frequency responses of the different pressure microphones recorded by means of the electrostatic actuator method

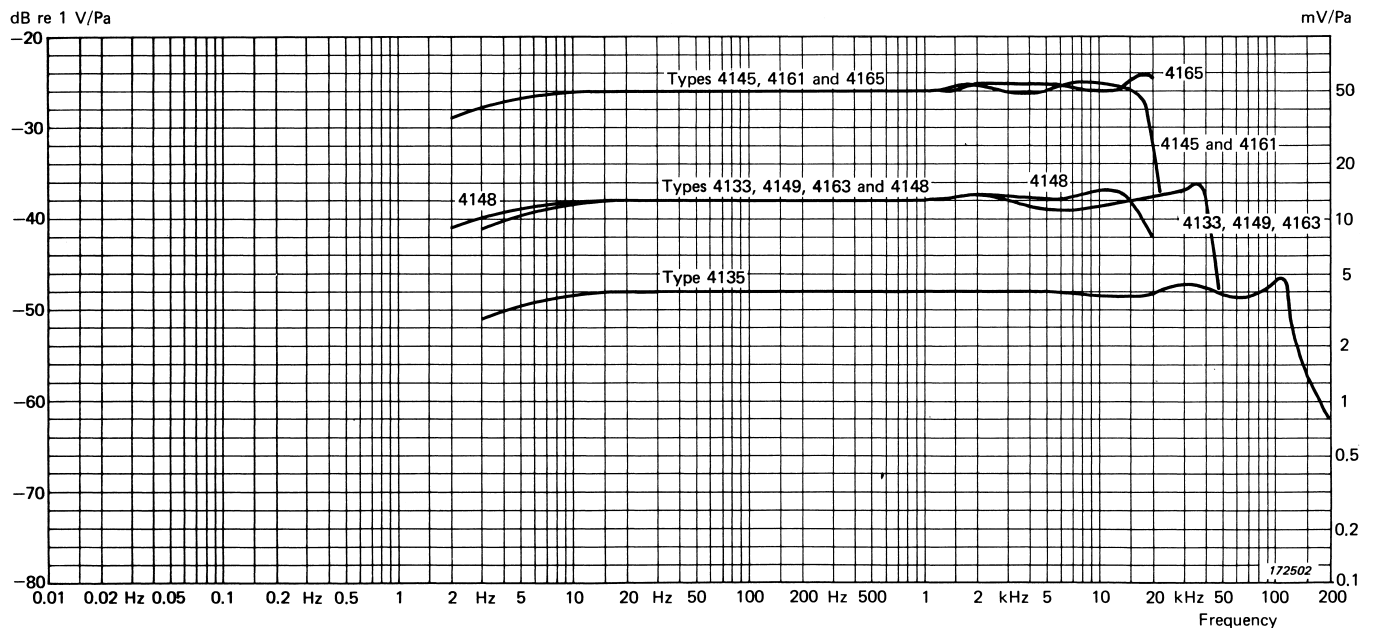


Fig.16. Typical 0° incidence frequency responses of the different free-field microphones recorded by means of the electrostatic actuator method and corrected according to the curves shown in Fig.20

ANSI Type	B & K Type
XL	4144, 45, 46, 47, 48, 33, 34, 49, 60, 61, 63, 65, 66
L	4144, 45, 46, 60, 61
M	4133, 34, 35, 36, 47, 49, 63
H	4135, 36, 38

Table 1

Each microphone cartridge is provided with an individual calibration chart including a complete frequency response curve recorded by the electrostatic actuator method. In the case of the free-field cartridges Types 4145, 4161, 4133, 4135, 4148, 4149, 4163 and 4165 the free-field response for 0° incidence is also given. See Fig. 19.

This is derived by adding the free-field corrections to the recorded pressure response. Similarly, the diffuse-field response is individually determined for the cartridges 4134, 4136, 4138, 4147 and 4166.

The cartridge Type 4147 is additionally supplied with an individual calibration chart showing the time constant of the pressure equalization. From this chart the lower limiting frequency can easily be determined. See Fig. 18.

For the microphones, a comprehensive handbook is available describing, among other things, the design, the theory and the operation of each condenser microphone together with extensive documentation of its properties. Also described are the application of accessories

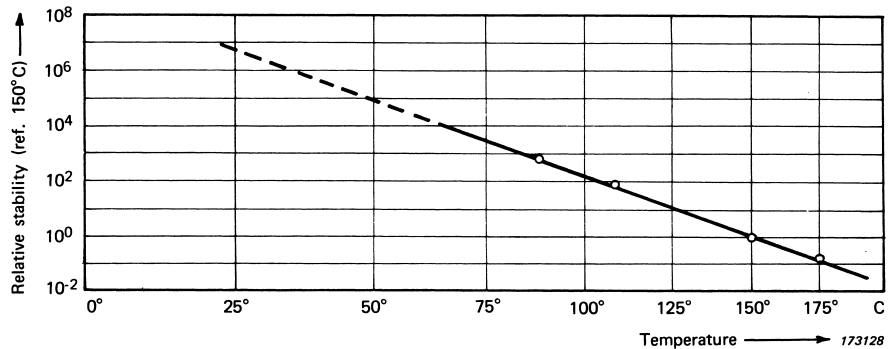


Fig. 17. Relative stability of the condenser microphone cartridges. For the 1" and 1/2" types the temperature coefficient is of the order 900 years/dB at room temperature and 2 hours/dB at 150°C

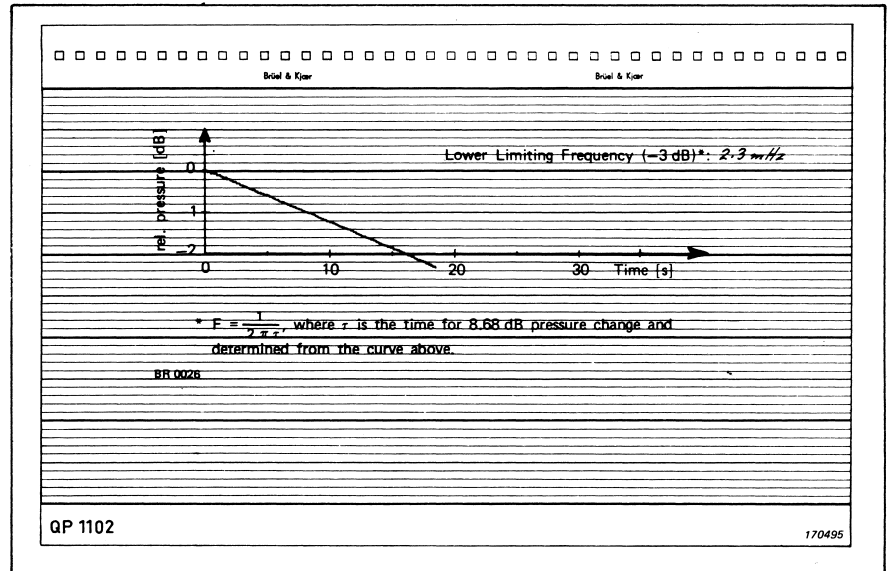


Fig. 18. Additional calibration chart as delivered with the Condenser Microphone Cartridge Type 4147

and the influence of different environmental factors, such as temperature, atmospheric pressure, humidity etc. on the microphone.

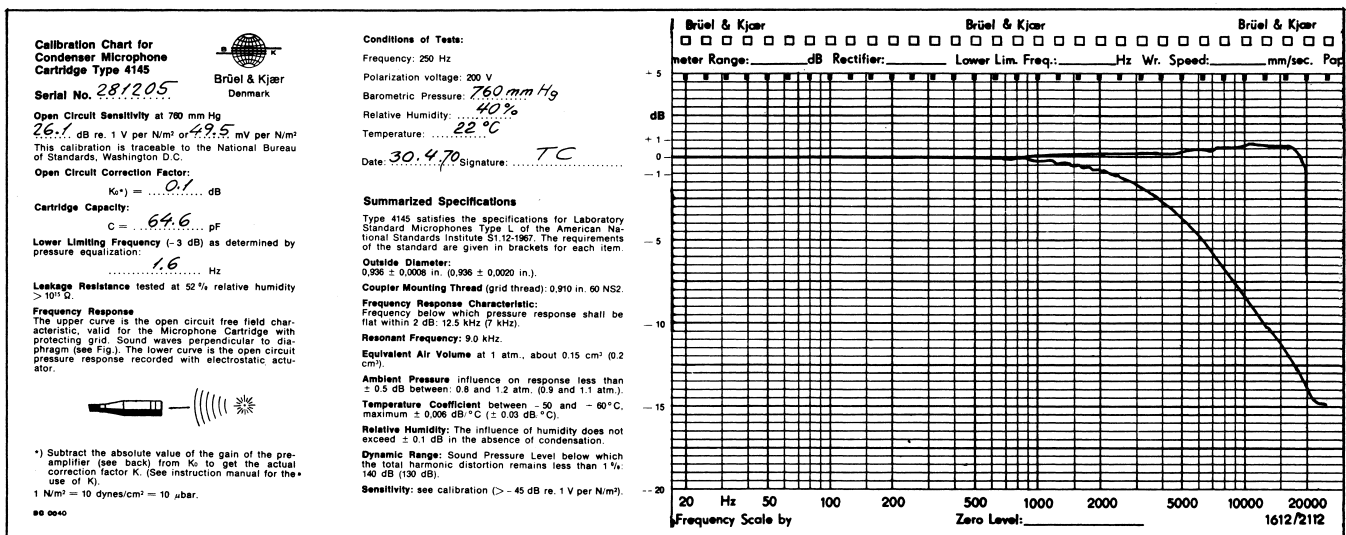


Fig. 19. Complete calibration chart as delivered with the condenser microphone cartridges

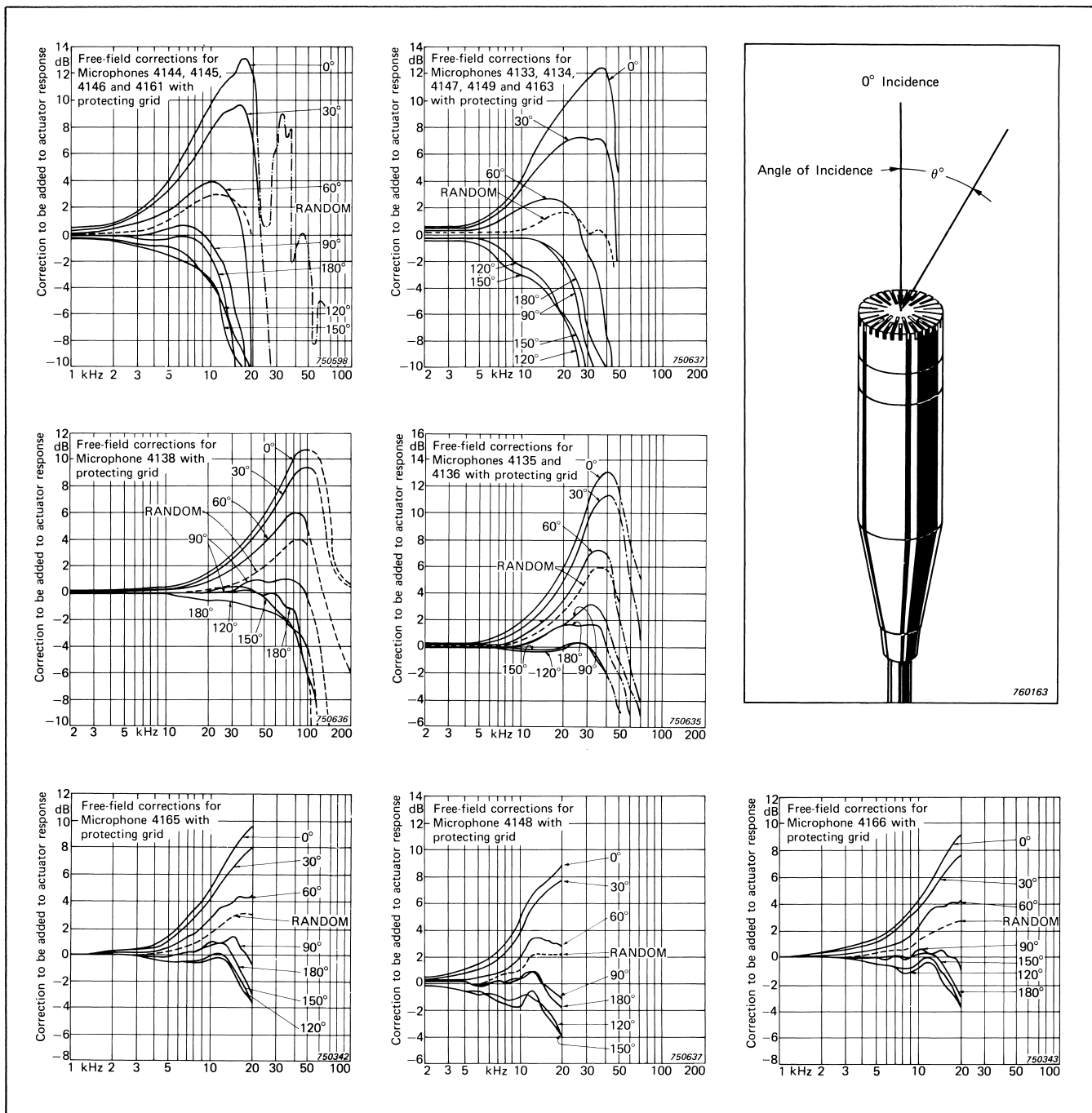


Fig.20. Free-field correction curves for the various B & K condenser microphone cartridges

**Free-Field Corrections  
(to be added to the pressure  
response obtained from the  
calibration chart)**

The free-field corrections which represent the increase of sound pressure caused by the diffractions of the sound waves around the microphone are only important at high frequencies where the wavelengths are comparable with the external dimensions of the microphone.

The free-field correction curves for diverse angles of incidence are

given in Fig.20. It can be seen that the random incidence (diffuse-field) corrections are very small at audio frequencies.

A microphone (1/2" to 1/8" diameter) with a flat pressure frequency characteristic should consequently be preferred for measurements in diffuse-fields, for example for indoor measurements. However, by mounting specially designed correctors (Nose Cones and Random Incidence Corrector) the response of the 1", 1/2" and 1/4"

free-field microphones can be made practically independent of the angle of incidence over an extended frequency range.

The same microphone will therefore be suitable for both free-field and diffuse-field measurements.

A detailed description of the characteristics and specifications of the microphones will be found in the handbook available.



## Accessories

To facilitate sound measurements under various conditions a variety of accessory equipment has been developed. A short description of these accessories is given in this section. For further information please see separate leaflets and the handbook available with the microphones.

### Calibration Equipment 4220, 4230, 4143, 2627 and 4221

For accurate calibration of the microphones and complete sound measuring set-ups either in the laboratory or in the field, the Pistonphone Type 4220 or the Sound Level Calibrator Type 4230 can be used (Fig.21). Both are battery operated and easy to handle. The 4220 gives a signal of 124 dB at 250 Hz and calibrates with an accuracy of  $\pm 0,2$  dB. The Sound Level Calibrator Type 4230 gives a signal of 94 dB at 1000 Hz and calibrates with an accuracy of  $\pm 0,25$  dB.

For reciprocity calibration in accordance with IEC 327 and IEC R 402 and for measurement of the frequency response of 1", 1/2", 1/4" and 1/8" condenser microphones by the electrostatic actuator method, the Reciprocity Calibration Apparatus Type 4143 is available (See Fig.22). It is an advanced, fast and easily operated high precision



Fig.21. Pistonphone Type 4220 and Calibrator Type 4230

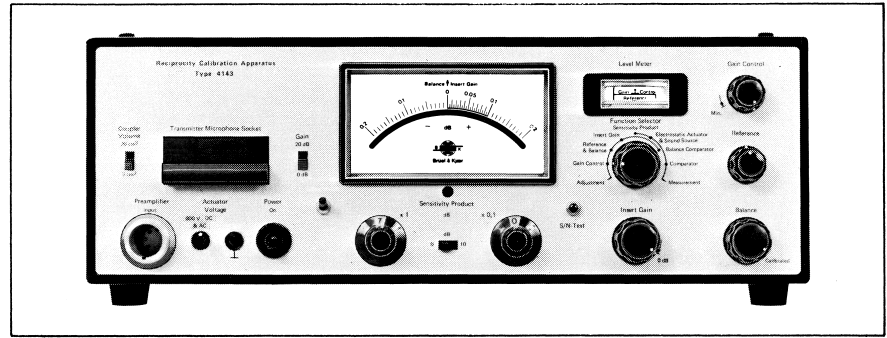


Fig.22. Reciprocity Calibration Apparatus Type 4143

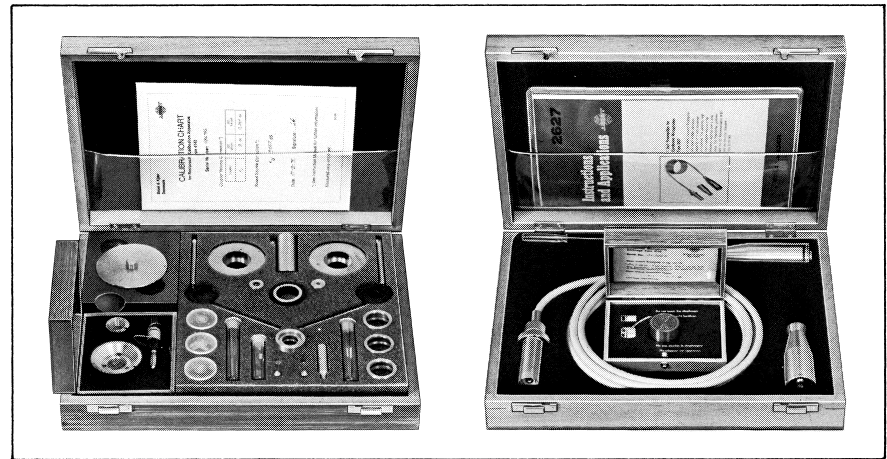


Fig.23. Accessories delivered with the 4143

laboratory instrument. The 4143 can also be used for comparison calibration of 1" and 1/2" microphones, measurement of front and equivalent volume, reciprocity and comparison calibration of accelerometers, reference sound source, ratio voltmeter and zero indicator. The 4143 is delivered with an individual calibration chart and a comprehensive range of accessories. See Fig.23.

For calibration of 1", 1/2", 1/4" and 1/8" condenser microphones at high sound levels the High Pressure Microphone Calibrator Type 4221 is an ideal tool (Fig.24). Due to the low acoustic impedance of the 4221 the sound pressure produced in the couplers is practically independent of variation in coupler volume, atmospheric pressure and changes in the process from adiabatic to isothermic at low frequencies. Calibration can be performed in the frequency ranges 3 Hz to 1000 Hz and  $10^{-2}$  Hz to 95 Hz at SPLs up to 164 dB. In connection with tonebursts, supplied from the Gating System Type 4440, calibration up to 170 dB SPL can be performed.

### Electrostatic Actuators UA 0023 and UA 0033

The actuators are designed for measurement of the pressure frequency response of the condenser microphone cartridges. They are available in two sizes UA 0023 for 1" microphones and UA 0033 for 1/2" microphones. The UA 0033 can also be used with 1/4" and 1/8" cartridges by means of the adaptors DB 0264 (1/4" to 1/2") and DB 0900 (1/8" to 1/2").



Fig.24. High Pressure Microphone Calibrator Type 4221

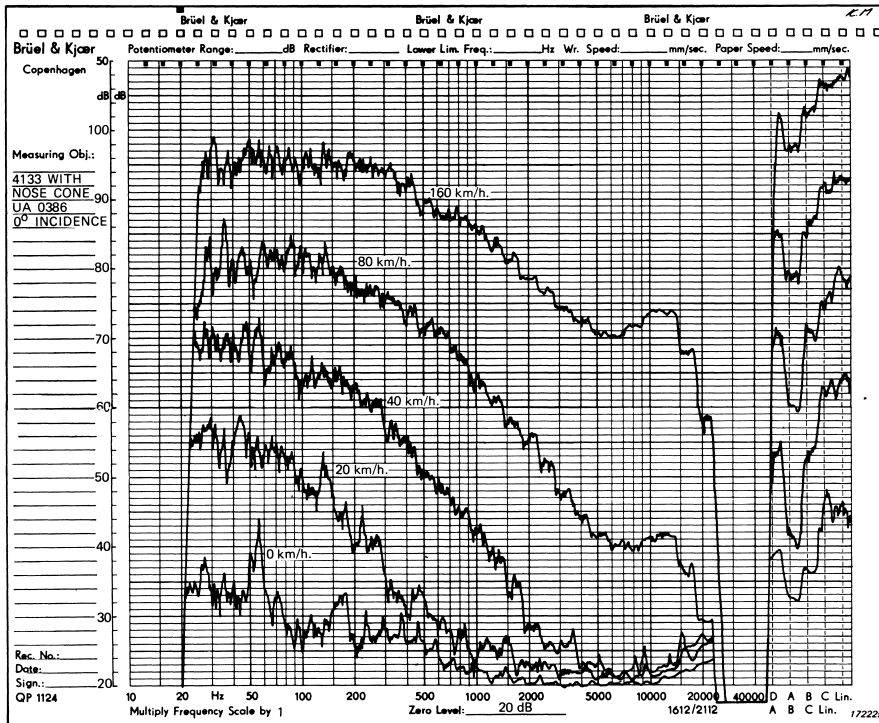


Fig. 25. Induced noise levels as a function of windspeed and frequency of the 1/2" free-field Condenser Microphone Cartridge Type 4133 fitted with a Nose Cone UA 0386

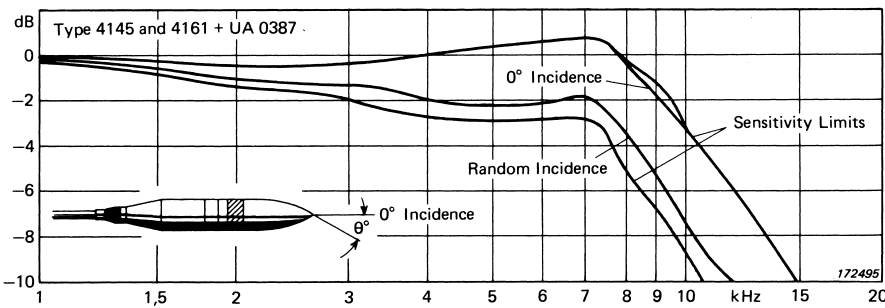


Fig. 26. Frequency response of the 1" free-field Condenser Microphone Cartridges Types 4145 and 4161 fitted with Nose Cone UA 0387

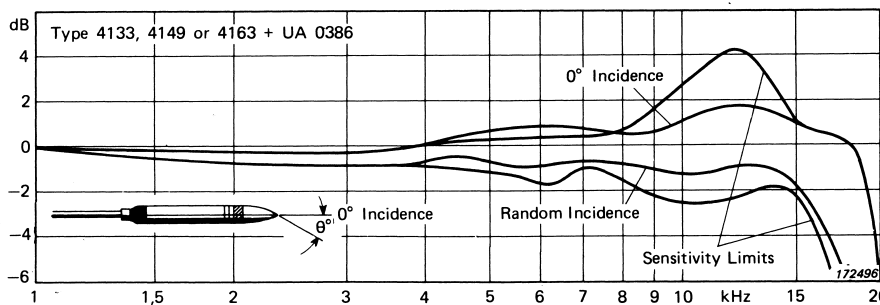


Fig. 27. Frequency response of the 1/2" free-field Condenser Microphone Cartridges Types 4133, 4149 and 4163 fitted with Nose Cone UA 0386

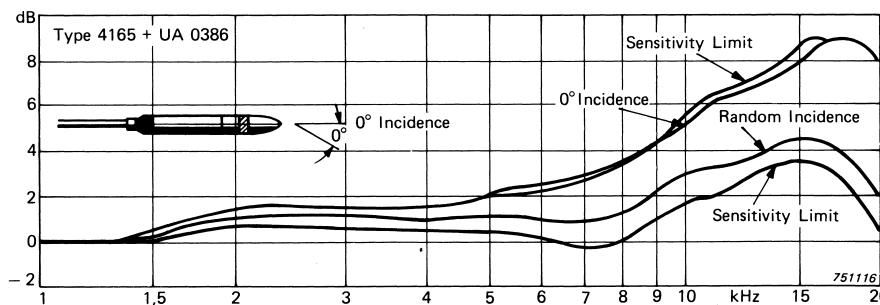


Fig. 28. Frequency response of the 1/2" free-field Condenser Microphone Cartridge Type 4165 fitted with Nose Cone UA 0386

### Nose Cones UA 0387, UA 0386, UA 0385 and UA 0355

The Nose Cones (Fig. 29) are designed to reduce the aerodynamically induced noise present when the microphones are exposed to high wind speeds, for example during sound measurements in wind tunnels. They are made to substitute the normal protection grid of the microphones, and are of a streamlined shape with a highly polished surface in order to give the least possible air resistance. The fine wire mesh around the circumference allows sound waves to penetrate to the microphone diaphragm.

Fig. 25 shows the aerodynamically induced noise at various wind speeds in a microphone cartridge 4133 fitted with Nose Cone UA 0386. The diagram is valid for microphones 4149 and 4163 also.

When the Nose Cones are used together with the free-field type microphone cartridges excellent omnidirectional characteristics are obtained (Figs. 26, 27, 28 and 31). Fig. 32 shows the omnidirectional characteristics of the 1/8" pressure cartridge fitted with Nose Cone UA 0355.

### Random Incidence Corrector UA 0055

The UA 0055 (Fig. 30) screws directly onto the one inch microphones Types 4145 and 4161 instead of the normal protection grid. It makes the microphones practically omnidirectional up to 10 kHz and should be used for measurements in diffuse sound fields. See Fig. 33.

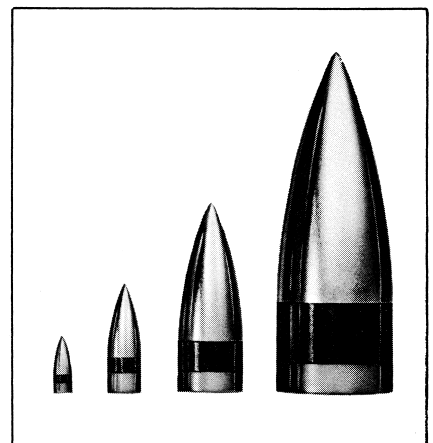


Fig. 29. Nose Cones UA 0355, UA 0385, UA 0386 and UA 0387

**Rain Cover UA 0393**

The Rain Cover (Fig.30) is designed to be mounted on B & K 1/2" condenser microphones instead of the normal protection grid, and allows permanent outdoor installation even under extreme weather conditions. When fitted, the Rain Cover will improve the omnidirectional characteristics of the 1/2" free-field microphones (see Fig.34). The combination of a 1/2" free-field cartridge, UA 0393 and Windscreen UA 0381 fulfil the requirements on directivity given in IEC R 179 for Precision Sound Level Meters. To allow remote calibration and checking of remote microphone installations the UA 0393 has a built-in electrostatic actuator. The Rain Cover can be delivered calibrated at the factory together with a 1/2" microphone cartridge to give an equivalent SPL of  $90 \pm 1$  dB by injection of an AC voltage of 215 V.

The B & K plugs JP 0012, which fit the actuator terminal are available in sets UA 0129, 20 plugs with mounting tool and UA 0130, 25 plugs only. The cable AC 0010 for plug JP 0012 is available in free length.

**NB.** The best weather protection is obtained when the Windscreen UA 0381 is used in conjunction with the Rain Cover with the pre-amplifier operating continuously.

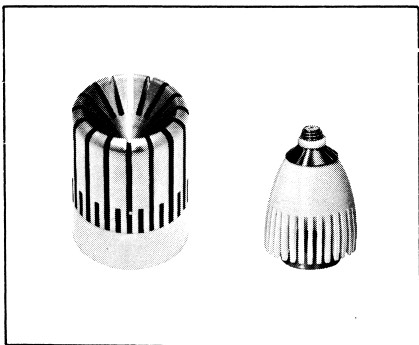


Fig.30. Random Incidence Corrector UA 0055 and Rain Cover UA 0393

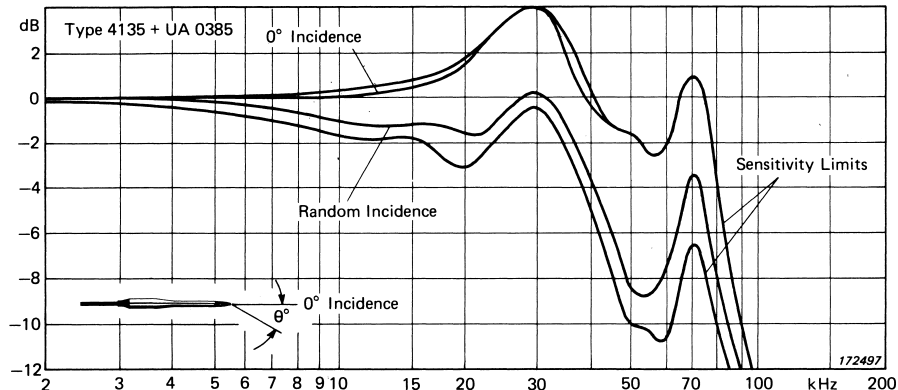


Fig.31. Frequency response of the 1/4" free-field Condenser Microphone Cartridge Type 4135 fitted with Nose Cone UA 0385

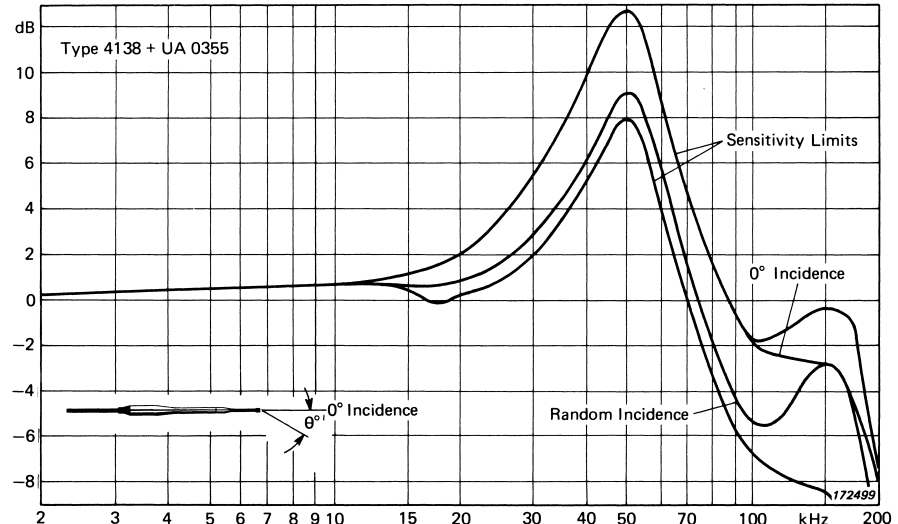


Fig.32. Frequency response of the 1/8" pressure Condenser Microphone Cartridge Type 4138 fitted with Nose Cone UA 0355

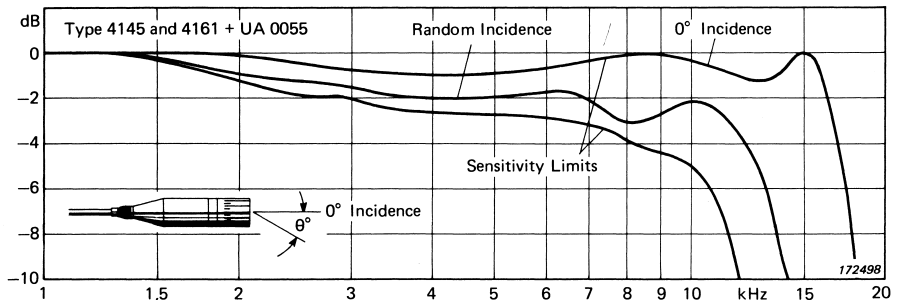


Fig.33. Frequency response of the 1" free-field Condenser Microphone Cartridges Types 4145 and 4161 fitted with Random Incidence Corrector UA 0055. The linearity is maintained practically up to 10 kHz, and the omnidirectivity is effective within  $\pm 3$  dB. (See also Fig.20)

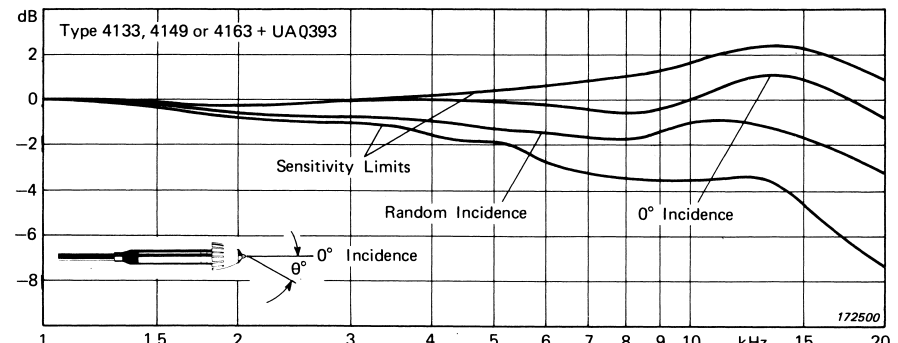


Fig.34. Frequency response of the 1/2" free-field condenser Microphone Cartridges Types 4133, 4149 and 4163 fitted with Rain Cover UA 0393

### Windscreen UA 0381

The Windscreen UA 0381 (Fig.35) for 1" and 1/2" microphones, reduces the aerodynamically induced noise during out-door sound measurements. The windscreen is designed for mounting on the microphone assembly and is covered with nylon cloth. It gives an effective reduction, of the order of 10 dB or higher, of wind induced noise at lower wind velocities. It is well suited for permanent outdoor installations in connection with Rain Cover UA 0393. Additionally it is equipped with spikes UA 0404 to prevent birds from resting on the top.

### Windscreens UA 0207, UA 0237 and UA 0459

The Windscreens UA 0207 and UA 0237 (Fig.35) fit the 1" and 1/2" microphone assemblies respectively. They are made of specially prepared porous polyurethane sponge attenuating wind noise 10 to 12 dB, at lower wind velocities, and are well suited for common outdoor sound measurements. These windscreens are only available as sets. **Set UA 0253** contains six 1" windscreens UA 0207, and set **UA 0254** contains six 1/2" windscreens UA 0237.

The Windscreen UA 0459, 65 mm diameter, is designed to fit the 1/2" Condenser Microphone Type 4125 but can also be used with the other 1/2" microphones if

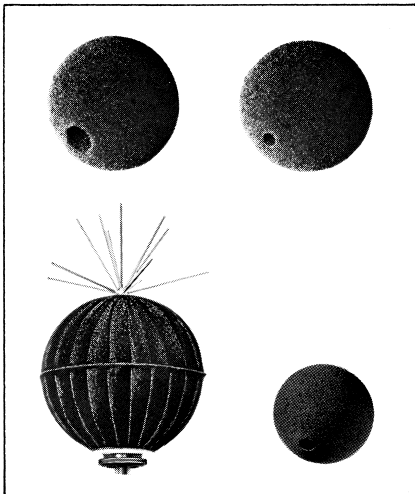


Fig.35. Windscreens UA 0381, UA 0207, UA 0237 and UA 0459

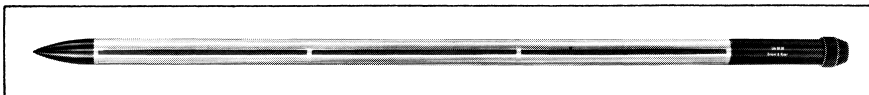


Fig.36. Turbulence Screen UA 0436

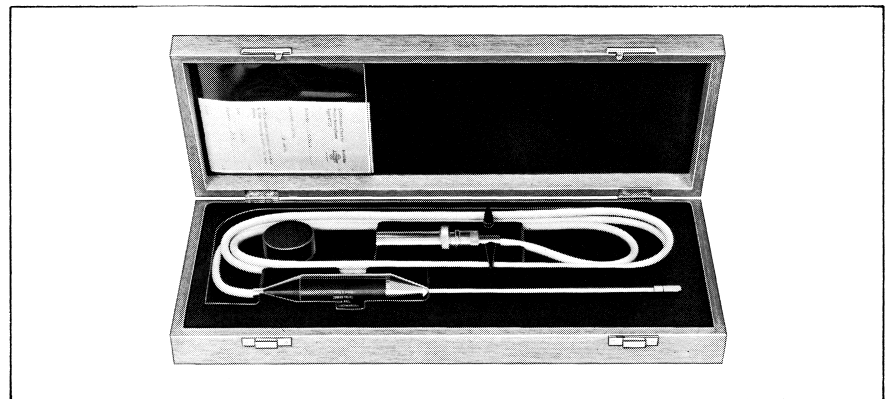


Fig.37. Probe Microphone Type 4170

a small screen is required. The UA 0459 has approximately the same properties as the UA 0237. The windscreen is available in sets of six as **UA 0469**.

For complete curves showing the influence of any of the windscreens upon the free-field corrections see the handbook for the microphones.

### Turbulence Screen UA 0436

The Turbulence Screen UA 0436 (Fig.36) is designed to attenuate turbulence noise, when measuring airborne noise in airducts, wind tunnels etc. The UA 0436 can be used together with any 1/2" free-field condenser microphone mounted on a 1/2" microphone preamplifier. The turbulence noise suppression by the use of the UA 0436 is approximately 14 dB better than that obtained with the Nose Cone UA 0386 in the frequency range 70 Hz to 1,5 kHz.

### Probe Microphone Type 4170 and Probe Microphone Kit UA 0040

Probe microphones can be used in a variety of applications, such as measurements inside the ear and inside ear protectors, measurements on sound insulating materials and inside intricate machinery, as well as in other confined spaces, e.g. small ducts, furnaces, oilburners etc.

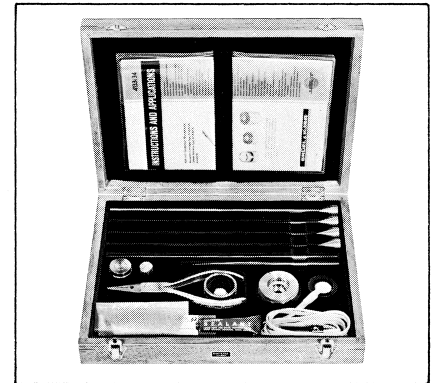


Fig.38. Probe Microphone Kit UA 0040

**Type 4170** (Fig.37) is a pre-adjusted probe microphone with built-in preamplifier. It uses an acoustical exponential horn to couple a probe tube to a 1/2" condenser microphone. An acoustic matching impedance at the microphone equalizes the frequency response of the assembly, thereby obtaining a frequency response from 30 Hz to 8 kHz within 4 dB. In order to obtain minimum disturbance in the sound field being measured the probe tube is very thin and has a high acoustic orifice impedance. The probe microphone is delivered with an individual calibration chart and an adaptor DP 0181 for fitting it to the Pistonphone Type 4220 or to the Calibrator Type 4230 for calibration.

**Probe Microphone Kit UA 0040** (Fig.38) includes 4 probe tubes with adaptors and gaskets for mounting on the B & K 1/2" Microphone Cartridge Type 4134. The outside diameters of the 4 probes are: 0,5, 1, 2 and 4 mm, and the length is 240 mm (except for the 0,5 mm probe which is 120 mm long). In addition, a coupler for the 4 different probe tube diameters is supplied to-

gether with a small earphone enabling the determination of the frequency response curves of the probe microphone by means of B & K generators and recorders. As requirement to length and width of the probes will vary with the application, the necessary tools and materials for cutting the probes and inserting damping material to make them suitable for any particular application are supplied with the Kit.



Fig.40. Power Supplies Types 2801, 2804 and 2807

**Power Supplies 2801, 2804 and 2807**

The Power Supply Type 2801 can supply all voltages for the microphone assemblies using 200V polarization voltage. The Power Supply Type 2804 is battery driven and can be used with the Preamplifier Type 2619 only. It supplies all necessary voltages for two microphone assemblies and can be adjusted to give 28 or 200V polarization voltage. It can thus supply the combination of preamplifier 2619 and any of the microphone cartridges. The Two Channel Power Supply Type 2807 can supply all voltages for two microphone assemblies using 200V polarization vol-

tage, and allows automatic switching between the measuring points.

**Outdoor Microphone Unit 4921**

The Outdoor Microphone Unit Type 4921 (Fig.39) has been designed to allow permanent outdoor noise monitoring. It consists of the 1/2" quartz-coated microphone Type 4149 fitted with Windscreen UA 0381 and spikes UA 0404, Rain Cover UA 0393 and a preamplifier all mounted on a stainless steel tube. A weather-proof case, to which the steel tube is connected, contains power supply, amplifier, calibration generator and a dehumidification system. Several different output possibilities are available to suit any particular measuring requirement. Moreover facilities for remote control and external supply of power and calibration signal are included. For further information see system development sheet "Airport Noise Monitoring Systems".

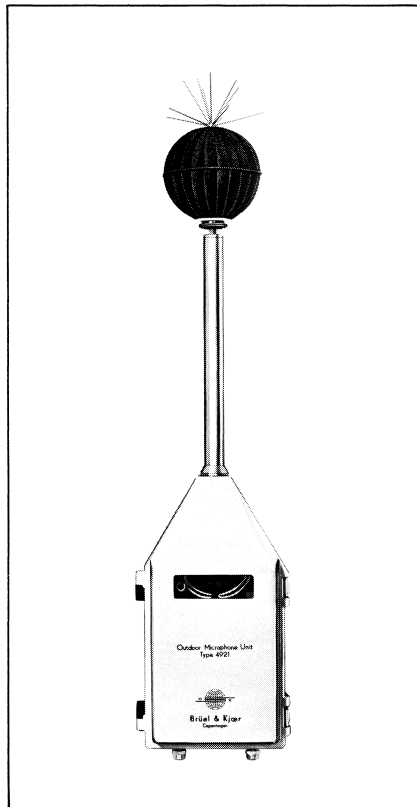


Fig.39. Outdoor Microphone Unit Type 4921

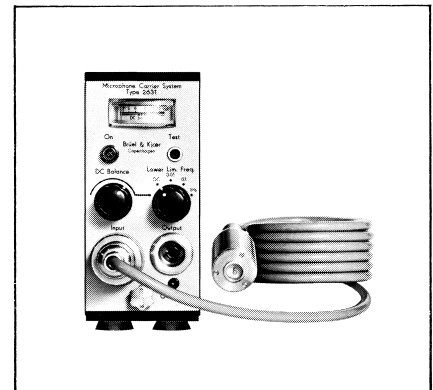


Fig.41. Microphone Carrier System Type 2631

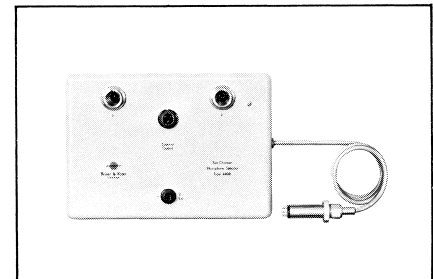


Fig.42. Two-channel Microphone Selector Type 4408



Fig.43. Sealing Kit UA 0240

**Microphone Carrier System 2631**

The Microphone Carrier System Type 2631 (Fig.41) is made for measurement of low frequency pressure variations and shock waves and should be used with the microphone cartridges Type 4146 or 4147. It supplies a carrier frequency of 10MHz to the microphone cartridge instead of the normal 200V polarization voltage.

**Two-Channel Microphone Selector 4408**

The Two-Channel Microphone Selector (Fig.42) is a junction box for externally controlled automatic or manual switching between two

B & K microphones with associated preamplifiers fed into a single amplifier.

**Sealing Kit UA 0240**

This kit (Fig.43) is for sealing the cartridges 4144 and 4145 so that measurements down to 0,1 Hz can be made. The kit is included with cartridge 4146 which is sealed at the factory.

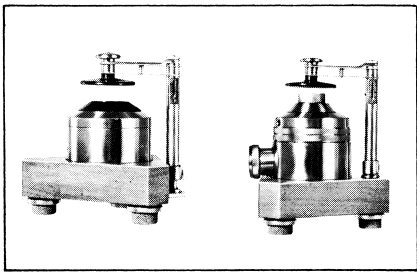


Fig.44. Artificial Ears Types 4152 and 4153

#### Artificial Ears and Couplers

The Artificial Ears Type 4152 and 4153 (Fig.44) and the couplers DB 0138, DB 0909, and DB 0161 have been developed for measurements on head- and earphones.

#### Dehumidifiers UA 0308 and UA 0310

The Dehumidifiers (Fig.45) UA 0308, 1/2" and UA 0310, 1" diameter are designed to be mounted between a microphone preamplifier or a sound level meter, and a back-vented 1/2" or 1" condenser microphone cartridge. They contain silica gel and effectively remove humidity from the air in the microphone. A small window in the Dehumidifiers' case allows the humidity content in the silica gel to be controlled, as the gel changes colour from blue in dry state to red when saturated. By heating for some hours at 100°C, or longer at lower temperatures, the gel is easily dried out again. When used in 100% RH they require drying-out approximately once a month.

#### Flexible Adaptors UA 0122 and UA 0123

The Flexible Adaptors (Fig.46) allow the 1/2" and 1/4" microphones to be mounted on the 1/2"

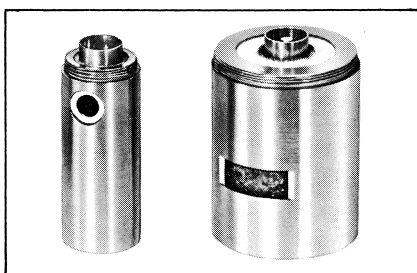


Fig.45. 1/2" and 1" Dehumidifiers UA 0308 and UA 0310

preamplifiers. The UA 0123 has a straight connector while the UA 0122 has a right angled connector. The flexibility of the adaptors makes the microphone assembly less sensitive to mechanical vibration and high temperatures (150°C). Both sets are delivered with adaptors for flush mounting of the microphone for measurement of turbulence and other pressure variations in the plane of a surface.

#### Adaptor DB 0225

The 1/2" to 1" Adaptor DB 0225 (Fig.46) screws onto the 1/2" microphones to give them the same mechanical dimensions as the 1" microphones. For use of 1/2" microphones with 1" standard couplers.

#### Adaptor DB 0264

The 1/4" to 1/2" Adaptor DB 0264 (Fig.46) screws onto the 1/4" microphones to give them the same mechanical dimensions as the 1/2" microphones. For use of 1/2" accessories with 1/4" microphones.

#### Adaptor DB 0900

The 1/8" to 1/2" Adaptor DB 0900 (Fig.46) screws onto the 1/8" microphones to give them the same mechanical dimensions as the 1/2" microphones. For use of 1/2" accessories with 1/8" microphones.

#### Portable Floor Stand UA 0049

This portable tripod (Fig.47) is of rugged construction. The microphone assembly is held in position

by means of the Tripod Adaptor UA 0354 which is included with the tripod. Height of the tripod is adjustable from 50 to 140 cm. The Adaptor UA 0354 may be ordered separately for use on any stand with 3/8" W thread. A 3/8" W to 1/4" W adaptor DB 1112 is supplied with the tripod.

**NB.** The Adaptor UA 0354 does not accept the 1/4" Preamplifier Type 2618.

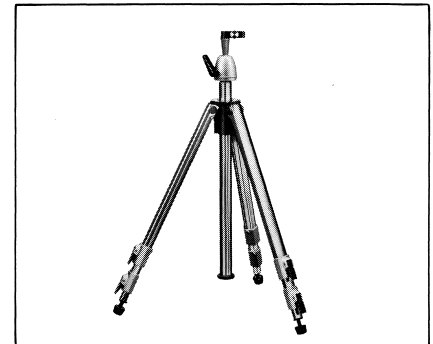


Fig.47. Portable Floor Stand UA 0049 fitted with Adaptor UA 0354

#### Rotating Microphone Boom Type 3923

The 3923 (Fig.48) is designed for use in sound power measurements to ISO/DIS 2880 and in building acoustics. It fulfils ISO/DIS 2880 section 7.1. It is battery powered, from rechargeable NiCd-cells, but can also be operated from mains. It has rotation times of 16, 32 and 64 s and at the end of each revolution a synchronization impulse is available. The length of the boom can be varied from 50 cm to 200 cm.

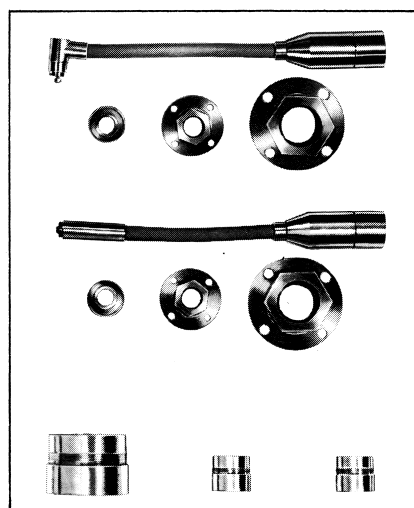


Fig.46. Adaptors UA 0122, UA 0123, DB 0225, DB 0264 and BB 0908

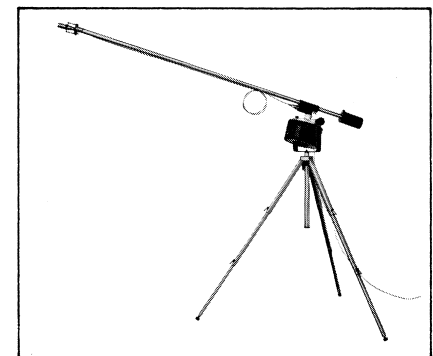


Fig.48. Rotating Microphone Boom Type 3923 mounted on a tripod

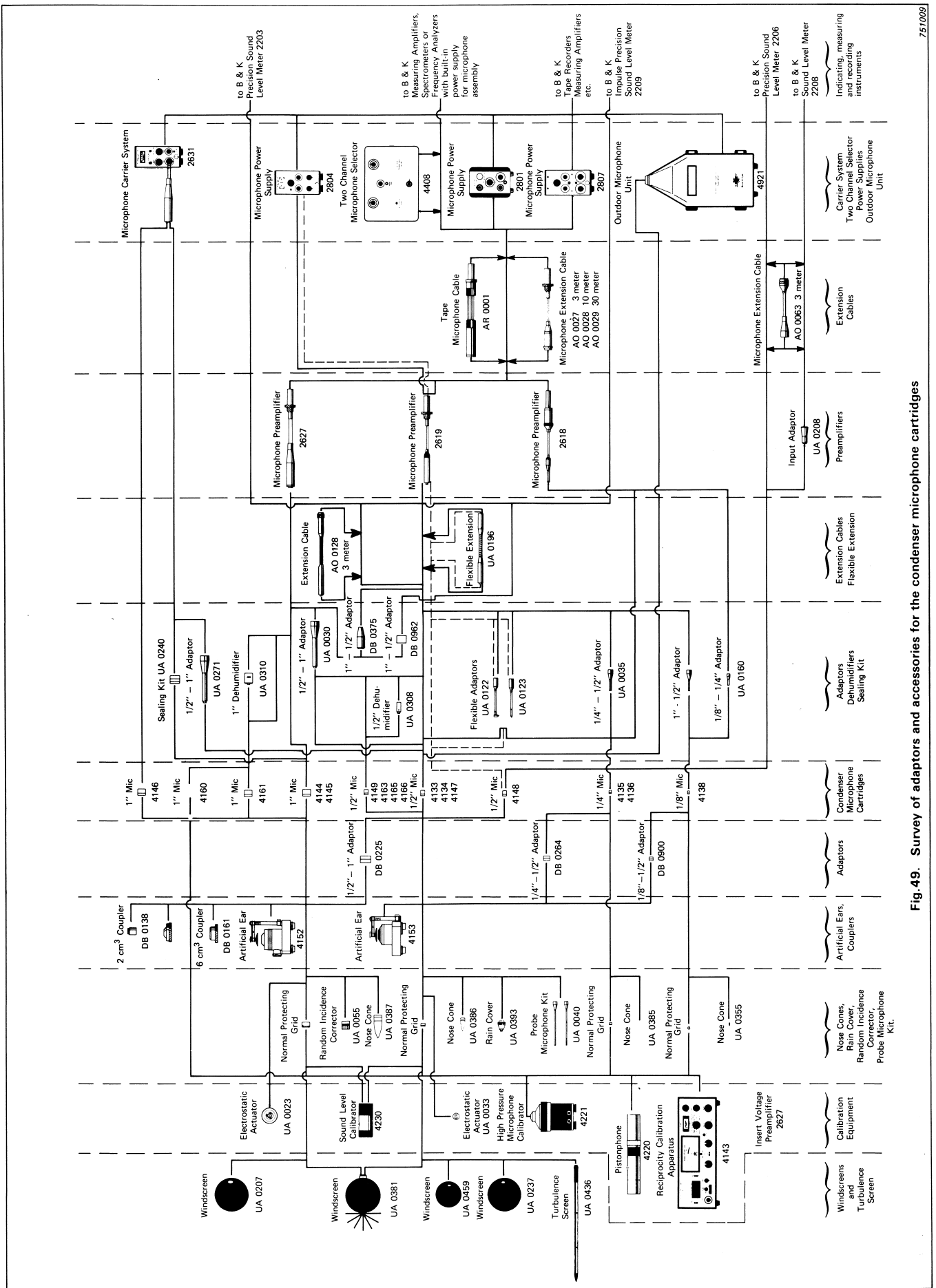


Fig. 49. Survey of adaptors and accessories for the condenser microphone cartridges

# Specifications

Type No.	4144	4145, 4161	4146*	4160	4133, 4149 4163	4134	4147*	4148	4165	4166	4135	4136	4138
Nominal Diameter	1"				1/2"								
Frequency Response Characteristic	Pressure	Free-Field (0° incidence)	Pressure	Pressure	Free-Field (0° Incidence)	Random Incidence and Pressure	Free-Field (0° Incidence)	Free-Field (0° Incidence)	Free-Field (0° Incidence)	Random Incidence and Pressure	Free-Field (0° Incidence)	Random Incidence and Pressure	Random Incidence and Pressure
Open Circuit Frequency Response* Flat within $\pm 2$ dB ( $\Delta \pm 2.5$ dB)	2.6 Hz to 8 kHz	2.6 Hz to 18.5 kHz	0.13 Hz to 8 kHz $\Delta$	2.6 Hz to 8.5 kHz	3.9 Hz to 40 kHz	3.9 Hz to 20 kHz	2.6 Hz to 16 kHz	3 Hz to 20 kHz	3 Hz to 20 kHz	3 Hz to 9 kHz	3.9 Hz to 100 kHz	3.9 Hz to 70 kHz	6.5 Hz to 140 kHz
Open Circuit Sensitivity* mV/Pa	50	50	$12 \times 10^{-3}$ pF/Pa	47	12.5	12.5	12.5	12.5	50	50	4	1.6	1.0
Open Circuit Sensitivity dB re 1 V/Pa	-26	-26	-	-26.5	-38	-38	-38	-38	-26	-26	-48	-56	-60
Open Circuit Distortion Limit (3%) dB re 20 $\mu$ Pa	> 148	> 148	> 138	> 146	> 160	> 160	> 150	> 140	> 146	> 146	> 164	> 172	> 168
Resonant Frequency (90° phase shift)	8 kHz	10 kHz	8 kHz	8 kHz	23 kHz	23 kHz	11 kHz	11 kHz	13 kHz	13 kHz	100 kHz	70 kHz	-
Polarization Voltage	200 V	200 V	-	200 V	200 V	200 V	28 V	28 V	200 V	200 V	200 V	200 V	200 V
Polarized Cartridge Capacitance at 250 Hz*	55 pF	66 pF	55 pF	55 pF	18 pF	18 pF	17 pF	19 pF	20 pF	20 pF	6.4 pF	6.4 pF	3.5 pF
Temperature Coefficients between -50°C and +60°C (dB/°C)	0.008	0.006	0.008	0.005	0.01	0.01	0.015	0.015	0.004	0.004	0.01	0.01	0.01
Equivalent Air Volume (at 1 atm) mm <sup>3</sup>	165	150	165	140	10	10	80	80	40	40	0.6	0.25	< 0.1
Expected Long Term Stability (extrapolated) at 23°	> 900 years/dB	> 900 years/dB	> 2 hours/dB	> 900 years/dB	> 150 years/dB	> 150 years/dB	> 900 years/dB	> 900 years/dB	> 300 years/dB	> 300 years/dB	-	-	-
Influence of Static Pressure (dB/atm)	-2	-1.8	-2	-2	-0.7	-0.7	-1.8	-1.8	-1	-1	-0.7	-0.25	-1
Influence of Vibration (1 g in axial direction) dB re 20 $\mu$ Pa	88	88	88	88	88	88	80	80	80	80	80	90	80
Influence of Relative Humidity	< 0.1 dB (in absence of condensation)												
Height of Cartridge without protecting grid with protecting grid	17 mm	17 mm	18.95 mm	19.30 mm	11 mm	12.7 mm	15.2 mm	16.3 mm	11.5 mm	12.6 mm	9.0 mm	10.5 mm	6 mm
Diameter of Cartridge without protecting grid with protecting grid	23.77 mm	23.77 mm	23.77 mm	23.77 mm	23.77 mm	23.77 mm	12.7 mm	13.2 mm	6.35 mm	7 mm	6.35 mm	7 mm	3.175 mm
Thread for protection grid or coupler mounting	23.11 mm — 60 NS2	23.11 mm — 60 NS2	-	-	12.7 mm — 60 NS2	12.7 mm — 60 NS2	12.7 mm — 60 NS2	12.7 mm — 60 NS2	6.36 mm — 60 NS2	6.36 mm — 60 NS2	M 3.175 x 0.2	M 3.175 x 0.2	M 3 x 0.2
Thread for preamplifier mounting	23.11 mm — 60 NS2	23.11 mm — 60 NS2	-	-	12.7 mm — 60 NS2	12.7 mm — 60 NS2	12.7 mm — 60 NS2	12.7 mm — 60 NS2	5.7 mm — 60 NS2	5.7 mm — 60 NS2	M 3 x 0.2	M 3 x 0.2	M 3 x 0.2

\* Individually calibrated

● For specifications with 10 MHz carrier frequency see data sheet for Microphone Carrier System 2631

■ 4149 only

**Brüel & Kjær**

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TELEX 10316



# Specifications

Type No.	1"			1/2"			1/4"			4138	
	4144	4145	4160	4133, 4149	4134	4147●	4148	4165	4166		4135
Nominal Diameter	1"			1/2"			1/4"				
Frequency Response Characteristic	Pressure	Free-Field (0° Incidence)	Pressure	Free-Field (0° Incidence)	Random Incidence and Pressure	Free-Field (0° Incidence)	Free-Field (0° Incidence)	Free-Field (0° Incidence)	Random Incidence and Pressure	Free-Field (0° Incidence)	Random Incidence and Pressure
Open Circuit Frequency Response*, Flat within ± 2 dB (Δ ± 2.5 dB)	2,6 Hz to 8 kHz	2,6 Hz to 18,5 kHz	2,6 Hz to 8,5 kHz	3,9 Hz to 40 kHz	3,9 Hz to 20 kHz	0,0055 Hz to 18 kHz	2,6 Hz to 16 kHz	2,6 Hz to 20 kHz	2,6 Hz to 9 kHz	3,9 Hz to 100 kHz	3,9 Hz to 70 kHz
Open Circuit Sensitivity* mV/Pa	50	50	47	12,5	12,5	1,1 × 10 <sup>-3</sup> pF/Pa	12,5	4	50	4	1,6
Open Circuit Sensitivity dB re 1 V/Pa	-26	-26	-26,5	-38	-38	-	-38	-48	-26	-48	-56
Cartridge Thermal Noise dB(A)	9,5	10	9,5	20	18	18	12,5	14,5	15	29,5	30,5
Open Circuit Distortion Limit (3%) dB re 20 μPa	> 146	> 146	> 146	> 160	> 150	> 150	> 140	> 164	> 146	> 164	> 172
Resonant Frequency (90° phase shift)	8 kHz	10 kHz	8 kHz	23 kHz	23 kHz	11 kHz	11 kHz	13 kHz	10 kHz	100 kHz	70 kHz
Polarization Voltage	200 V	200 V	200 V	200 V	200 V	28 V	28 V	19 pF	20 pF	200 V	200 V
Polarized Cartridge Capacitance at 250 Hz*	55 pF	66 pF	55 pF	18 pF	18 pF	17 pF	17 pF	6,4 pF	20 pF	6,4 pF	3,5 pF
Temperature Coefficients between -50°C and +60°C (dB/°C)	-0,008	-0,006	-0,005	-0,01	-0,01	-0,015	-0,015	-0,01	-0,01	-0,01	-0,01
Equivalent Air Volume (at 1 atm) mm <sup>3</sup>	165	150	140	10	10	80	80	40	40	0,6	0,25
Expected Long Term Stability (extrapolated) at 150°C	> 900 years/dB	> 900 years/dB	> 900 years/dB	> 150 years/dB	> 150 years/dB	> 900 years/dB	> 900 years/dB	> 300 years/dB	> 300 years/dB	> 300 years/dB	> 300 years/dB
Influence of Static Pressure (dB/atm)	-2	-1,8	-2	-0,7	-0,7	-0,25	-1,8	-0,7	-1	-0,7	-0,25
Influence of Vibration (1 g in axial direction) dB re 20 μPa	88	88	88	88	88	80	80	80	80	80	90
Influence of Relative Humidity	< 0,1 dB (in absence of condensation)			< 0,1 dB (in absence of condensation)			< 0,1 dB (in absence of condensation)			< 0,1 dB (in absence of condensation)	
Height of Cartridge without protection grid	17 mm	17 mm	18,95 mm	11 mm	11 mm	15,2 mm	11,5 mm	9,0 mm	11,5 mm	9,0 mm	6 mm
Height of Cartridge with protection grid	19 mm	19 mm	19,30 mm	12,7 mm	12,7 mm	16,3 mm	12,6 mm	10,5 mm	12,6 mm	10,5 mm	6,7 mm
Diameter of Cartridge without protection grid	23,77 mm	23,77 mm	23,77 mm	12,7 mm	12,7 mm	12,7 mm	12,7 mm	6,35 mm	12,7 mm	6,35 mm	3,175 mm
Diameter of Cartridge with protection grid	23,77 mm	23,77 mm	23,77 mm	13,2 mm	13,2 mm	13,2 mm	13,2 mm	7 mm	13,2 mm	7 mm	3,5 mm
Thread for protection grid or coupler mounting	23,11 mm — 60 NS2	23,11 mm — 60 NS2	—	12,7 mm — 60 NS2	12,7 mm — 60 NS2	12,7 mm — 60 NS2	12,7 mm — 60 NS2	6,36 mm — 60 NS2	12,7 mm — 60 NS2	6,36 mm — 60 NS2	M 3,175 × 0,2
Thread for preamplifier mounting	23,11 mm — 60 NS2	23,11 mm — 60 NS2	—	12,7 mm — 60 NS2	12,7 mm — 60 NS2	12,7 mm — 60 NS2	12,7 mm — 60 NS2	5,7 mm — 60 NS2	12,7 mm — 60 NS2	5,7 mm — 60 NS2	M 3 × 0,2

● Individually calibrated  
 ■ For specifications with 10 MHz carrier frequency see data sheet for Microphone Carrier System 2631  
 ■ 4149 only

In the following section a short description of characteristics and application ranges of each microphone is given.

## General Purpose Types

### Free Field Response Types

**4145.** 1" diameter for general and very low sound level measurements.

**4161.** 1" diameter similar to 4145. It is furnished with backventing and is used with Dehumidifier UA 0310 for measurements in humid atmospheres.

**4133.** 1/2" diameter for general purposes, loudspeaker and microphone measurements.

**4163.** 1/2" diameter with characteristics and application ranges similar to those of 4133. It is designed with back-venting in order to be used in humid environments in conjunction with Dehumidifier UA 0308.

**4165.** 1/2" diameter for general and low level sound measurements. It has a sensitivity similar to that of a 1" cartridge and may therefore be used as a substitute for 1" cartridges in applications where these would introduce intolerable disturbance in the sound field being measured. The 4165 has a quartz covered diaphragm and is backvented for use with the 1/2" Dehumidifier UA 0308 for measurements in humid environments.

**4135.** 1/4" diameter for general high level, high frequency measurements and model work.

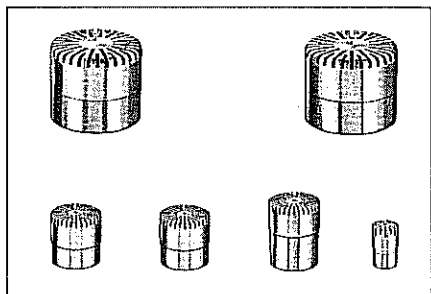


Fig. 6. Types 4145, 4161, 4133, 4163, 4165 and 4135

### Pressure Response Types

**4144.** 1" diameter used for coupler measurements, audiometer calibration, low frequency measurements and as laboratory standard.

**4134.** 1/2" diameter for medium and high level measurements in the audio range and coupler measurements. In conjunction with Probe Microphone Kit UA 0040 the 4134 can be used as probe microphone.

**4166.** 1/2" diameter for random incidence measurements. Same application range as the 4165. The 4166 has also a quartz covered diaphragm and is backvented for use together with the UA 0308.

**4136.** 1/4" diameter for random incidence, coupler, high level and high frequency measurements.

**4138.** 1/8" diameter to be used for high level and very high frequency measurements, model work and as point source or point receiver.

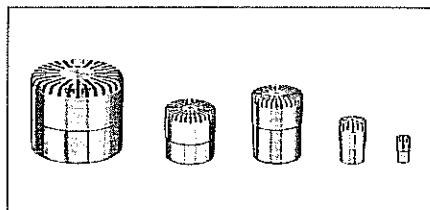


Fig. 7. Types 4144, 4134, 4166, 4136 and 4138

## Special Types

### Very Low Frequency Types

**4146.** 1" diameter. Pressure type corresponding to 4144 except that it has been sealed at the factory to give a lower limiting frequency below 0,1 Hz. A sealing kit UA 0240 is available for sealing the cartridges 4144 and 4145. The 4146 is used for very low frequency, acoustic pulse and sonic boom measurements in conjunction with the 10 MHz Microphone Carrier System Type 2631.

**4147.** 1/2" diameter. Pressure type designed with special attention to an airtight microphone housing to bring the lower limiting frequency below 0,01 Hz. It is used for ultra low frequency, acoustic pulse and sonic boom measurements in conjunction with Adaptor UA 0271 and Microphone Carrier System 2631.

### Low Polarization Voltage Type

**4148.** 1/2" diameter. Free-field type used with 28 V polarization voltage for general sound level measurements with battery operated set-

ups such as Preamplifier Type 2619 in conjunction with Power Supply Type 2804, or with Miniature Sound Level Meters Types 2206 and 2208. 2208 requires an additional Input Stage UA 0208.

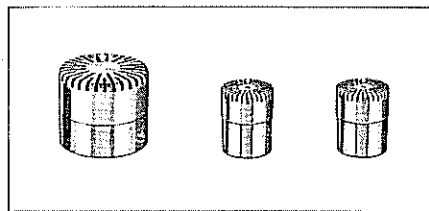


Fig. 8. Types 4146, 4147 and 4148

### Type for Humid and Corrosive Environments

**4149.** 1/2" diameter. Free-field type, similar to 4133 but with diaphragm and backplate covered with thin layers of quartz (Fig. 10), which protects against damage caused by corrosive atmospheres. It is back-vented for use with Dehumidifier UA 0308, (see section "Accessories"). The 4149 is used in noise monitoring systems such as the Type 4921, for permanent outdoor installations.

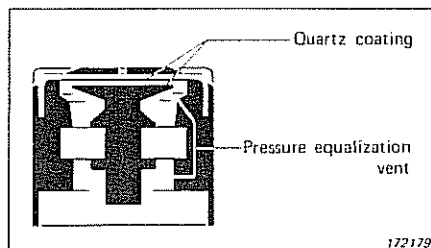


Fig. 9. Cross sectional view of the quartz-coated microphone Type 4149

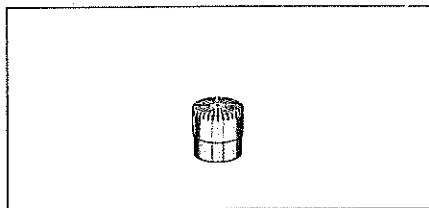


Fig. 10. Type 4149

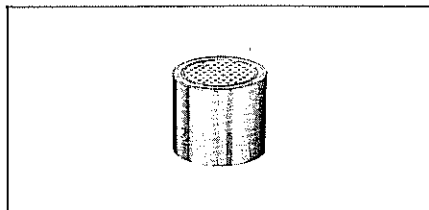


Fig. 11. Type 4160

### Western Electric WE 640 A Equivalent

**4160.** 1" diameter. Pressure type for coupler measurements and as laboratory standard. It has a linear pressure response and is equivalent

# General Description

## Construction

The different cartridges have the same basic design (Figs.2 and 3). The smaller diameters generally provide higher limits for the frequency and dynamic ranges, at the expense of a lower sensitivity.

Fig.2. shows a sectional view of a condenser microphone cartridge. Depending on type, the insulator is made of either silicone-treated quartz or a synthetic ruby to give a well defined reference surface. The diaphragm is made of pure nickel and backplate and housing are made of high nickel alloys. This practically eliminates variations of sensitivity with temperature.

During production the microphone cartridges are subjected to a high temperature (150°C), forced aging process which ensures a long term calibration stability.

Special care has been devoted to the equalization of the static air pressure between the inside and the outside of the cartridge so as to give a well defined and low lower limiting frequency.

The pressure equalization arrangements used in the cartridges are shown in Figs.4 and 5. The Types 4148, 4149, 4160, 4161, 4163, 4165 and 4166 are back-vented for use with dehumidifiers, while all the other types are side-vented.

The cartridges are available with four different diameters:

1"\*, 23,77 mm (Types 4144, 4145, 4146, 4160 and 4161)

1/2", 12,70 mm (Types 4133, 4134, 4147, 4148, 4149, 4163, 4165 and 4166)

1/4", 6,35 mm (Types 4135 and 4136)

1/8", 3,175 mm (Type 4138)

This wide range of condenser microphones is made available to cover an extensive field of applications.

\* Exactly 0,936 inch in accordance with the American Standard ANSI S1.12-1967.

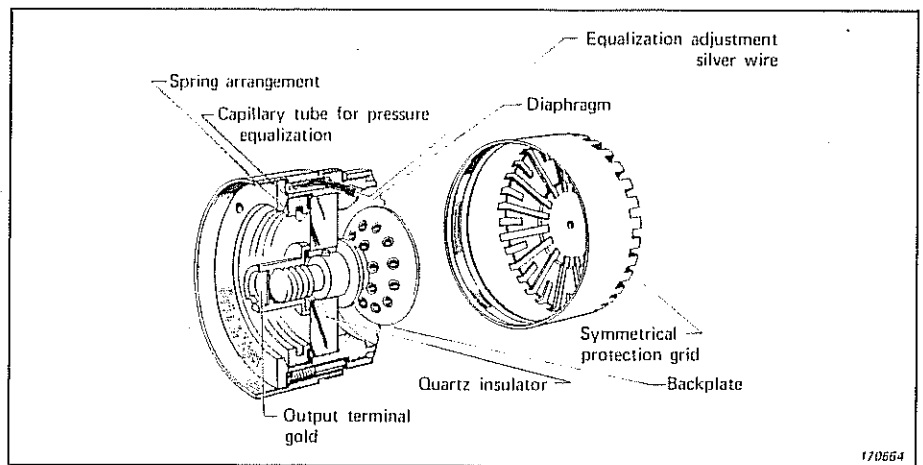


Fig.2. Sectional view of a 1" condenser microphone cartridge

The microphones 4144, 4145, 4133, 4134, 4165, 4166, 4135, 4136 and 4138 together cover the requirements to environment, frequency and dynamic ranges for most sound measurements, while the special microphones 4146, 4147, 4148, 4149, 4160, 4161 and 4163 are developed to suit particular applications.

Each size is available with either linear, 0° incidence, free-field frequency response or linear pressure response (the 1/8" Type 4138 pressure only). When using a free-field microphone it should be pointed towards the sound source, if the sound field is judged to come mainly from that direction, while a pressure microphone should be arranged so that the diaphragm is parallel to the direction of sound. In coupler measurements a pressure microphone is used. No specific orientation of the microphone in relation to the sound source is required. The smaller pressure microphones (1/2", 1/4" and 1/8" types) can be used for random incidence measurements at audio frequencies, as their frequency responses in this range are less dependent on angle of incidence. The 1" free-field microphones Types 4145 and 4161 can also be used for random measurements in the audio range, when fitted with Random Incidence Corrector UA 0055.

Two low cost microphones, Types 4117 and 4125, (not described in this leaflet) are also available. The 4117 is a 1" piezoelectric microphone designed for use on the Sound Level Meter Type 2208. The 4125 is a 1/2" condenser microphone cartridge for use on the

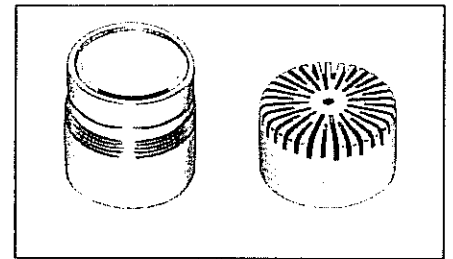


Fig.3. 1" cartridge with protecting grid removed. The diaphragm is flat and practically flush with the housing. This ensures a well defined acoustic impedance and an excellent omnidirectivity

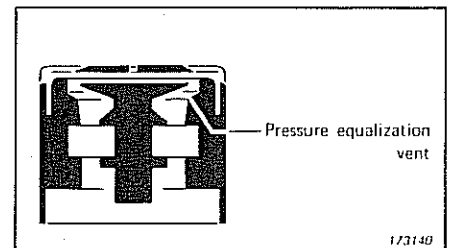


Fig.4. Side-vented microphone cartridge

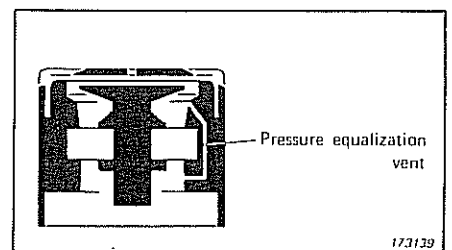


Fig.5. Back-vented microphone cartridge

Sound Level Meter Type 2219, the Noise Dose Meters Types 4424 and 4425 and with the self-contained microphone system consisting of the 1/2" Microphone Preampifier Type 2642 and the battery operated two-channel Microphone Power Supply Type 2810. The 2642 may also be used with the other B & K 1/2" condenser microphones. For further information on Types 4117, 2208, 4125, 4424, 4425, 2219, 2642 and 2810, see separate product data sheets.