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Product Data

Condenser Microphone Cartridges — Types 4133 to 4181

USES:

- ❍ Precision acoustic measurements
- ❍ Laboratory reference standards
- ❍ With sound level meters
- ❍ In Noise measurement systems satisfying IEC and ANSI standards
- ❍ Electro-acoustic measurement

FEATURES:

- ❍ Frequency ranges from 2.6 Hz to 140 kHz
- ❍ Dynamic ranges from -34 dB to 180 dB SPL
- ❍ Choice of pressure, random or free-field response
- ❍ Very wide operating temperature range and low ambient-temperature coefficient
- ❍ Supplied with individual calibration charts
- ❍ Robust construction
- ❍ High resistance to humidity
- ❍ Wide range of accessories

Forming a complete range of microphones for accurate acoustic measurements, Brüel & Kjær condenser microphones are precision engineered from materials selected to give long term stability and operational reliability. Their resistance to humidity is very high, temperature range very wide and temperature coefficients extremely small. A robust construction makes them easy to handle in the field.

Each microphone cartridge is delivered in a protective mahogany box and supplied with an individual calibration chart giving the frequency response and all data necessary for precision measurements.

Introduction

The seventeen condenser microphones in Brüel & Kjær's traditional range have been carefully designed to fulfil the requirements of acoustic professionals, and supplement the Brüel & Kjær Falcon™ Range of microphones. You will find that it is not only the electro-acoustic specifications that are high, but also the mechanical properties. This high standard and attention to detail is a result of over 40 years leadership in the field of microphones, coupled with a critical choice of materials and craftsmen.

You will also find that these microphones can be used with a wide range of accessories and equipment, allowing you to build up the measurement systems of your choice without compromising quality or standards.

Microphone Handbook

This data sheet cannot cover in detail all the aspects of the microphone cartridges and accessories. Detailed information can be found in the handbook titled "Condenser Microphones", available from Brüel & Kjær, order number 033–0089. This describes in depth the design, theory and operation of each microphone cartridge, together with extensive documentation of its properties. Also described and illustrated graphically are the application of accessories and the influence of environmental fac-

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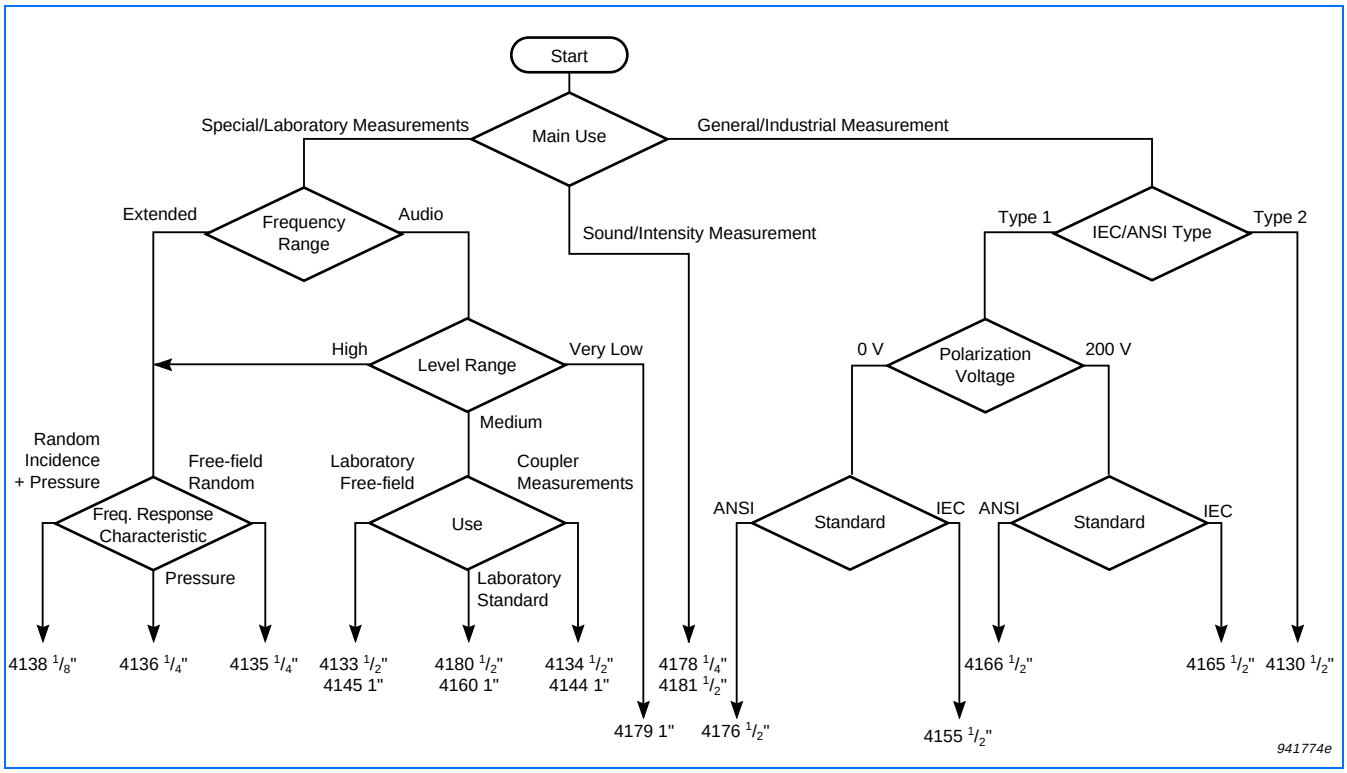

Fig. 1 Flow chart to help you choose the correct microphone from the Brüel & Kjær standard range of microphones

tors, such as temperature, atmospheric pressure and humidity.

Selecting a Microphone for Your Needs

To make sure you select the right microphone to match you needs, you will probably have to consider one or more of the following criteria:

- Standards (IEC or ANSI)
- Environment (lab., industrial, etc.)
- Free-, diffuse- or pressure-field
- Frequency range
- Polarization

By considering these factors and using the flow chart shown in Fig. 1 you will be able to find the microphone or group of microphones that suit your needs. Reference to Table 2 and to the specifications for each microphone will then enable you to make the appropriate choice.

General Description

The different cartridges in the traditional Brüel & Kjær range all have the same basic design, irrespective of size (see Fig. 2). The smaller diameters generally provide higher limits for the frequency and dynamic ranges, at the expense of a lower sensitivity.

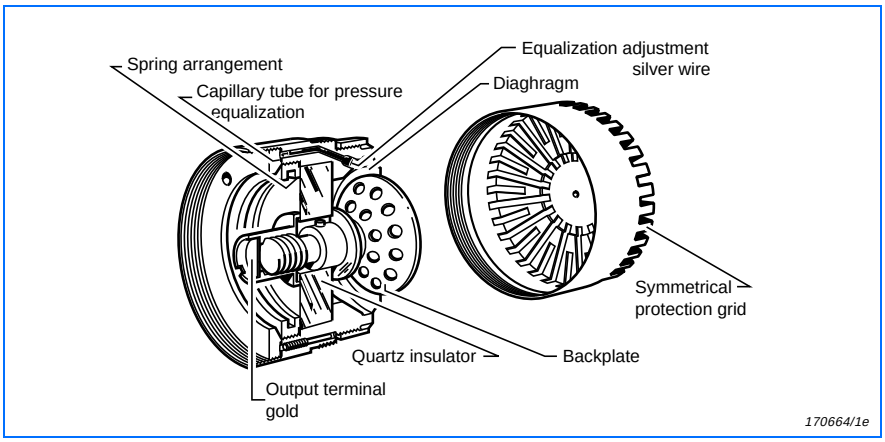

Fig. 2 Sectional view of a typical microphone cartridge

Materials of Construction

Depending on the type, the insulator is made either of silicone-treated quartz, synthetic sapphire or synthetic ruby to give dimensional stability. The diaphragm consists mainly of nickel and the backplate and housing are made of high nickel alloys. This minimises variations in sensitivity with temperature.

Polarization

All types of condenser microphone require an electric field to be present between the backplate and the diaphragm when being used. The Brüel & Kjær microphones obtain this field either internally or externally.

The internally charged microphones utilize a pre-polarized charge-carrying "electret" layer which is deposited on the backplate. These microphones are also categorized as 0 V polarization voltage – meaning the polarization feed to the preamplifier needs to be grounded (not floating).

Externally polarized microphones obtain the charge for the electric field from a DC power supply connected to the microphone via the preamplifier. Charge build-up the backplate is not instantaneous, due to the high charge

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resistance of the preamplifier. Therefore externally polarized microphones only reach the correct working voltage after about one minute. Before this time a microphone may not be within specification.

Artificial Ageing

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

The predicted long-term stability is of the order of 1 dB over several hundred years at room temperature. Although difficult to verify this in practice, the sensitivities of several microphone cartridges measured periodically at Brüel & Kjær's laboratory from 1974 to 1990 changed by only 0.05 dB, confirming the predicted long term stability.

Static Pressure Equalization

Special care has been taken in the design of the system for equalization of the static air pressure between the inside and outside of the cartridge to give a low and well-defined lower limiting frequency. There are two types of pressure equalization used in the cartridges, side-vented and rear-vented (see Fig. 3 and Fig. 4). 1/2" back vented types can be used with Dehumidifier UA 0308 in especially humid environments.

A special case of the rear-vented types is the microphone Type 4181. This microphone is designed to be used as a pair in sound intensity measurements. A patented two-stage resistance-compliance network leading to the rear-vent gives very small phase shifts at low frequencies (less than 3° down to 10 Hz) and a low sensitivity to sound pressure at the vent opening. This allows very accurate intensity measurements to be made close (less than 100 mm) to the sound source, in very reactive sound fields and at critical measurement points.

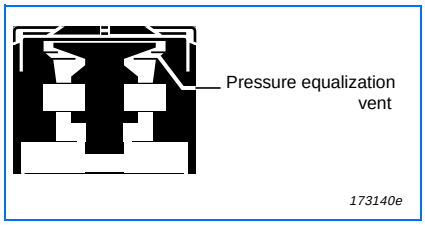

Fig.3 Side-vented microphone cartridge

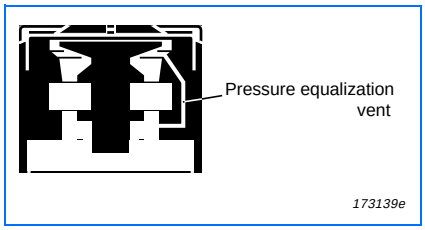

Fig.4 Rear-vented microphone cartridge

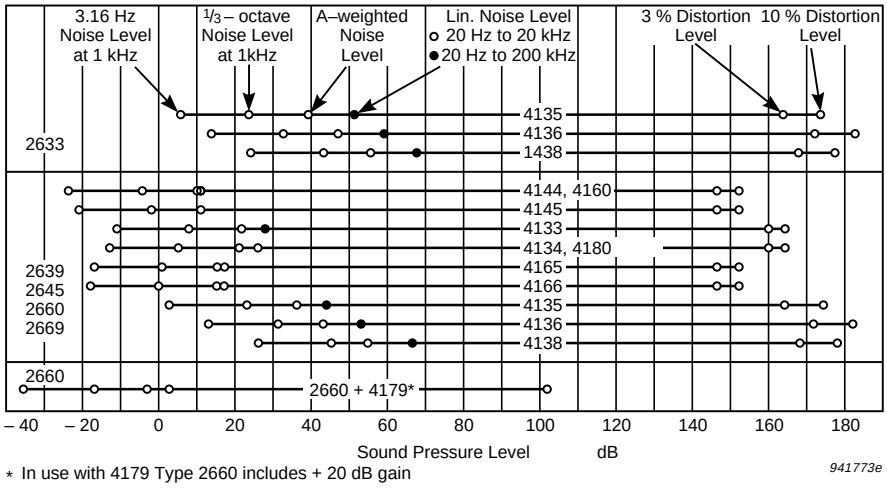

Fig.5 Typical dynamic ranges of various Brüel & Kjær condenser microphone and preamplifier assemblies. The upper limit is given for two degrees of distortion at 100 Hz, while the lower limit indicates the system noise floor for various bandwidths of the associated measurement equipment. The limits for 3.16 Hz and 1/3 octave bandwidths are valid at 1 kHz only

Free-field Response or Pressure-field Response

Cartridges are available with either linear 0°-incidence free-field response or linear pressure response (1/8″ type linear pressure response only). When using a free-field response microphone it should be pointed towards the sound source. In some applications a pressure response microphone may be used for free-field measurements if orientated so that the plane of the diaphragm is parallel to the direction of the sound. In coupler measurements a pressure response microphone is used. In this case no specific orientation of the microphone in relation to the sound source is required. The smaller pressure response microphones (1/2", 1/4", 1/8") can be used for random-incidence measurements at audio frequencies, as their frequency responses in this range are less dependent on the angle of incidence. 1″ free-field response microphone Type 4145 may also be used for random-incidence measurements, when fitted with Random-incidence Corrector UA 0055.

Measurement of sound intensity is a special case of pressure measurement. Brüel & Kjær use two identical microphones mounted at a fixed distance and opposite each other in their intensity probes. These microphones (1/4" Type 4178 or 1/2" Type 4181), are always supplied as a closely phase- and amplitude-matched pair.

Microphone Assemblies

In general a microphone assembly will consist of a microphone cartridge and a microphone preamplifier. The cartridge screws directly onto the preamplifier housing if both have the same diameter, or use is made of adaptors if the diameter is different. The most usual adaptors to use are given in the specifications. For unusual diameter-combinations of microphone and preamplifier, please contact Brüel & Kjær.

All the microphone preamplifiers are carefully designed to achieve high input impedance, low output impedance and very low inherent noise. Typically a preamplifier has 0 dB gain, an input capacitance of 0.2 pF and an input impedance between 10 GΩ and 50 GΩ. Frequency responses are flat between 1 Hz and 200 kHz.

For further details of these preamplifiers see product data sheets for Types 2633, 2639, 2642, 2645, 2660, 2669, 2671, and sound intensity probes 3545/3548.

Preamplifier Types

Eight different microphone preamplifiers types are available:

Type 2633 is a 1/4" preamplifier.

Type 2639 is a 1/2" preamplifier, available in two versions: **2639S** consisting of the preamplifier together with accessories delivered in a mahogany case, and **2639T** consisting of the preamplifier alone.

Type 2642 is a low-cost 1/2" preamplifier which is used exclusively with

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1/2" microphone Type 4130 and power supply Type 2810.

Type 2645 is a 1/2" preamplifier which is similar in design, performance and application to the Type 2639, but also includes an insert-voltage calibration facility for insert-voltage calibration of 1″ and 1/2" microphones in accordance with IEC 327 and ANSI S1.10–1966. The preamplifier may be operated in either driven or grounded shield modes.

Type 2645 is available in two versions: **2645S** with accessories and **2645T** without accessories.

Type 2660 has been specially developed as part of a low-noise microphone system consisting of the 2660 and 1″ microphone Type 4179. Together, these instruments constitute a system for pressure and sound power level measurements of very-low-level sources. A three position switch on the preamplifier allows selection of 0 dB gain, +20 dB gain or special "4179" position. The Type 2260 can also be used for free-field reciprocity calibration and reducing system cross-talk due to the switchable 20 dB gain.

Type 2669 is a 1/2" preamplifier, available in two versions: **2639B** fitted with B&K preamplifier plug and **2669L** fitted with LEMO plug.

Type 2671 is a 1/2" Deltatron™ preamplifier for use only with prepolarized microphones.

Type 2668 is a dual preamplifier used exclusively with matched microphone cartridges in sound intensity applications.

Power Supply

The stabilized polarization voltage for the microphone cartridges (200 V) and the power supply for the microphone preamplifiers are available via the 7-pin preamplifier input socket fitted to the range of Brüel & Kjær measuring amplifiers and frequency analyzers, to which the microphone assemblies can be connected directly.

For operation with other equipment and for special applications, a microphone assembly can be powered by a Brüel & Kjær power supply. These power supplies provide the necessary voltages to the cartridge and preamplifier via a 7-pin socket and pass the signal through without compromising noise or frequency response.

Sound intensity probes are connected to ancillary equipment via 18-pin LEMO connectors.

Assembly Response

All specifications in this product data sheet are open-circuit values, meaning that the cartridges look into an infinitely high impedance. In practice, however, the microphone cartridges are used together with a preamplifier which will influence the response of the total assembly.

The size of the influence depends on the preamplifier input impedance, the capacitance of the microphone (and adaptor), and the attenuation/amplification of the preamplifier itself. The total response is found by adding the open circuit response to the response curves given in the product data sheet for the microphone preamplifier.

Preamplifiers typically only influence the cartridge sensitivity by a few tenths of a dB.

Fig. 5 shows typical dynamic ranges of microphone and preamplifier assembly combinations.

Cartridge Response

The microphone cartridges have well-defined operating characteristics. Their sensitivities are high in relation to their dimensions and, as can be seen from Fig. 7 and Fig. 8, their frequency ranges are very wide.

Individual Calibration

The microphone cartridges fulfil the requirements of ANSI S1.12–167 "Specifications for Laboratory Standard Microphones", as indicated in Table 1.

ANSI Type	B & K Type
XL	4133, 4134, 4144, 4145, 4160, 4165, 4166
L	4144, 4145, 4160
M	4133, 4134, 4135, 4136, 4180
H	4135, 4136, 4138

Table 1 Classification of Brüel & Kjær condenser microphones under ANSI S1.12–1967

Each cartridge is supplied with an individual calibration chart which includes a complete frequency response curve recorded by the electrostatic actuator method. In the case of the free-

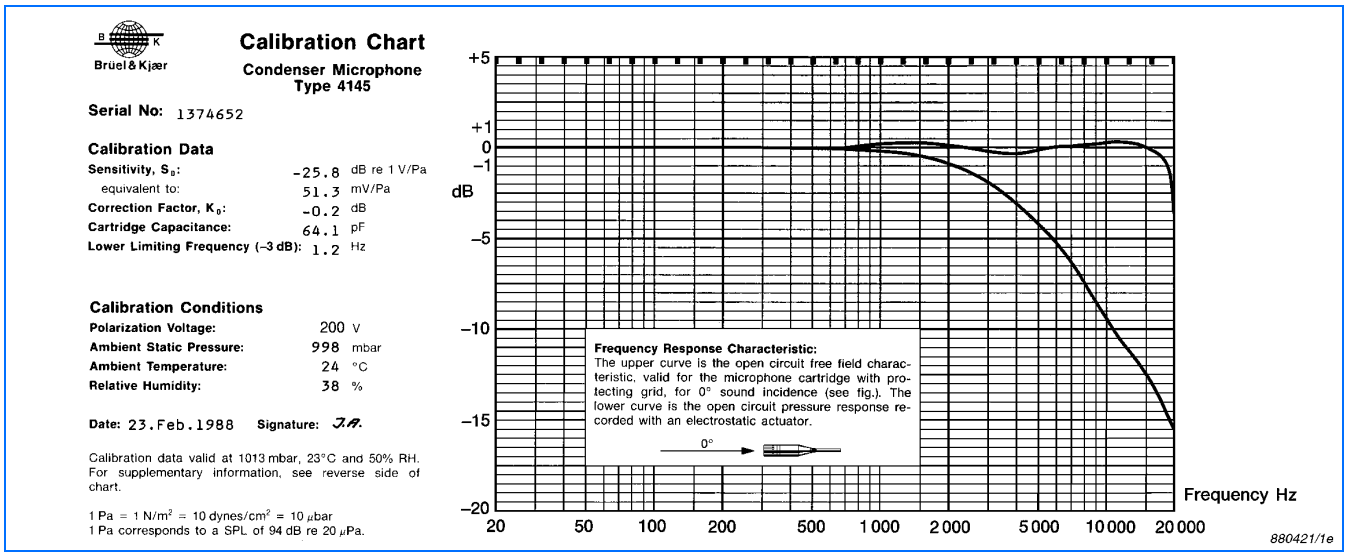

Fig. 6 Example calibration chart delivered with the condenser microphone cartridges

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field cartridges, the 0° incidence free-field response is also given.

An example calibration chart for the 1″ cartridge Type 4145 is shown in Fig. 6.

Free-field Corrections

The free-field corrections are added to the pressure (actuator) response of the microphone in order to obtain the free-field response at a particular angle of incidence. Free-field corrections represent the increase of sound pressure caused by diffraction of the sound waves around the microphone and are only significant at high frequencies where the wavelength is comparable with the external dimensions of the microphone. The free-field curves for diverse angles of incidence are given in Fig. 9. It can be seen that the random incidence (diffuse-field) corrections are very small at audio frequencies.

A microphone with a flat pressure-frequency characteristic should be preferred for measurements in diffuse fields, for example in most in-

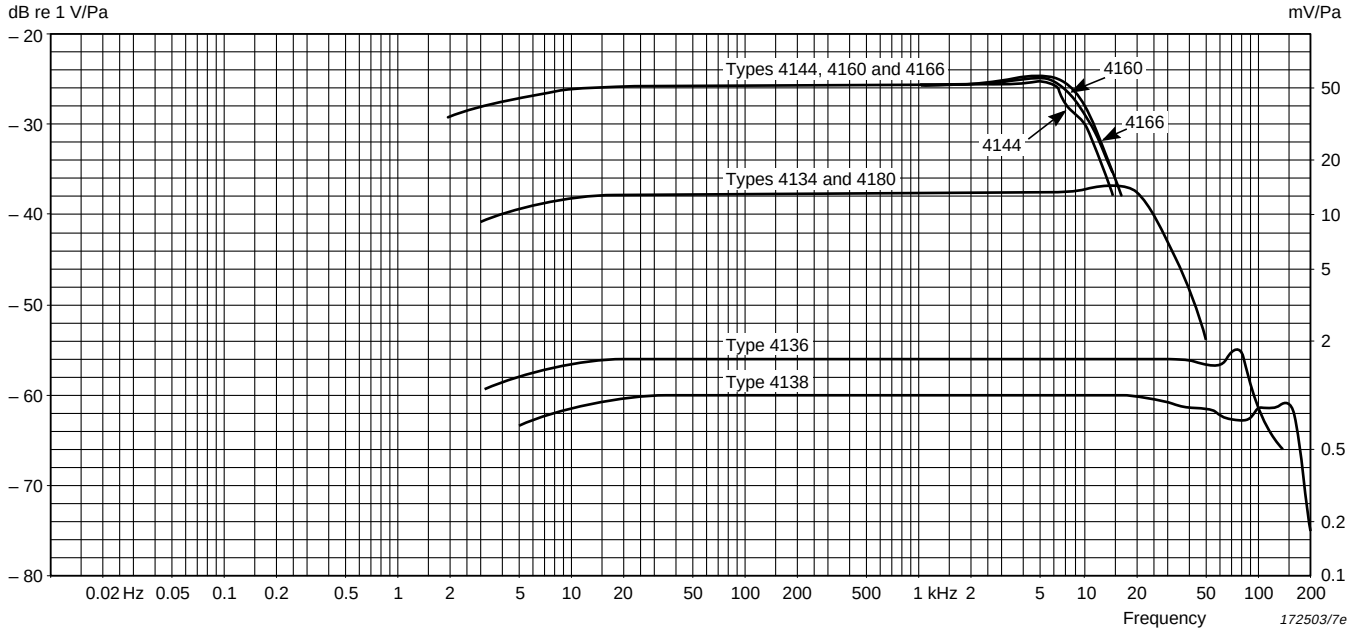

Fig. 7 Typical frequency responses of the different pressure response microphones recorded by means of the electrostatic actuator method

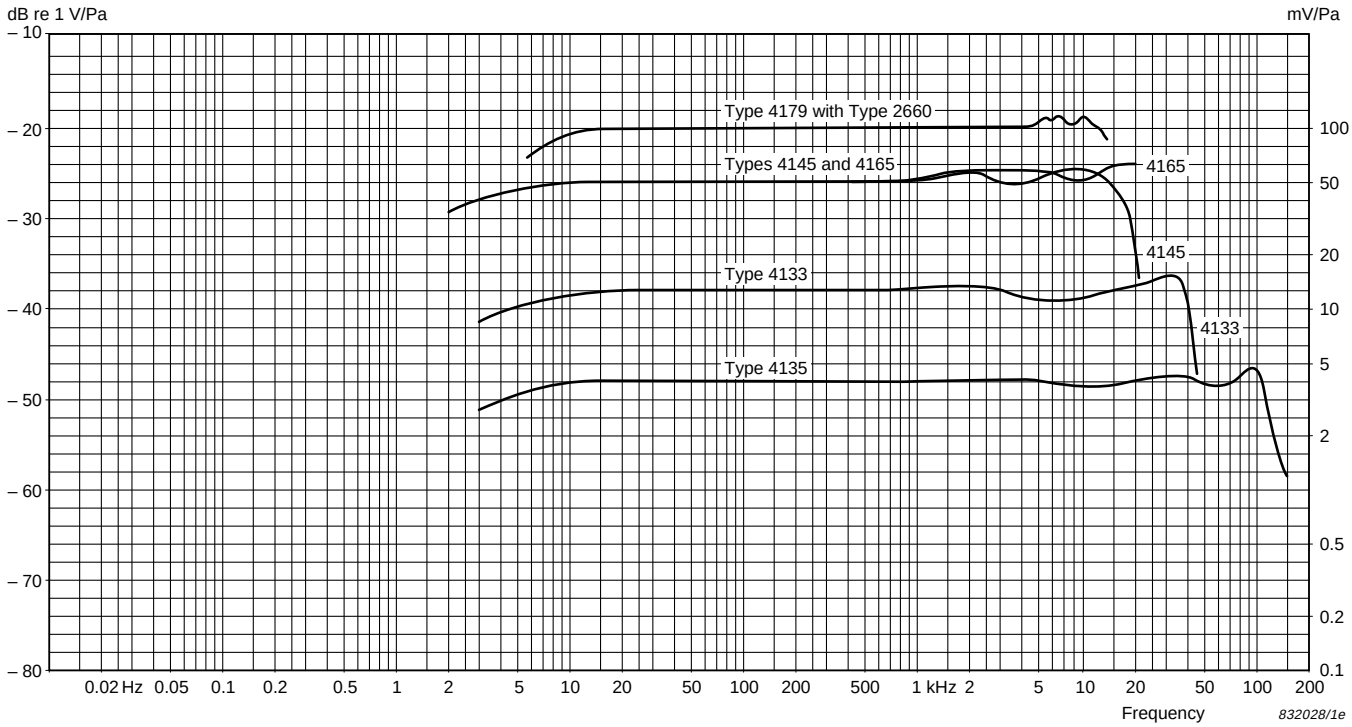

Fig. 8 Typical 0° incidence free-field frequency responses of the different free-field microphones recorded by means of the electrostatic actuator method and corrected according to the curves shown in Fig. 9

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door measurements. However, by mounting specially designed correctors (nose cones) on the cartridges, the response of the Type 4145 and all 1/2" and 1/4" free-field microphones can be made practically independent of angle of incidence

Special Microphones

Probe Microphone Type 4182

The Probe Microphone Type 4182 has a choice of probe tubes, stiff or flexible, making the microphone very adaptable for measurements in awkward places. Physically it is small and light, with a durable construction. The probe microphone is useful in a range from about 1 Hz to 22 kHz.

Weatherproof Microphone Unit Type 4184

The Weatherproof Microphone Unit Type 4184 is for use in permanent and semi-permanent or portable noise-monitoring systems. The unit is fully rotational about its vertical axis without any undesirable reflections from its casing affecting the noise measurements being done.

The unit is based on a probe tube system which has allowed the microphone cartridge to be installed within the casing of the unit itself.

For further information on these products please refer to the relevant product data sheets.

Type number	4130	4133	4134	4135	4136	4138	4144	4145	4155	4160	4165	4166	4176	4178	4179	4180	4181
Nominal Diameter	1/2"	1/2"	1/2"	1/4"	1/4"	1/8"	1"	1"	1/2"	1"	1/2"	1/2"	1/2"	1/4"	1"	1/2"	1/2"
Frequency Response Characteristic*	FF & RI	FF	P & RI	FF & RI	P	P & RI	P	FF	FF	P	FF	P & RI	FF & RI	FF	FF	P	FF
Open Circuit Frequency Response† (2 dB)	6.5 Hz to 8 kHz	4 Hz to 40 kHz	4Hz to 20 kHz	4 Hz to 100kHz	4 Hz to 70kHz	6.5 Hz to 140kHz	2.6 Hz to 8kHz	2.6 Hz to 18kHz	4 Hz to 16kHz	up to 8kHz ±1dB	2.6 Hz to 20kHz	2.6 Hz to 10kHz	6.5 Hz to 12kHz	4 Hz to 100kHz	10 Hz to 10kHz	up to 20kHz ±1.5dB	0.3Hz to 16kHz
Open Circuit Sensitivity dBre.1V/Pa	–40	–38	–38	–48	–56	–60	–26	–26	–26	–26.5	–26	–26	–26	–48	–20	–38	–39
Open Circuit Sensitivity mV/Pa	10	12.5	12.5	4	1.6	1.0	50	50	50	47	50	50	50	4	100	12.5	11.2
Lower Limiting Frequency (–3 dB)	0.5 Hz to 5 Hz	1 Hz to 3 Hz	1 Hz to 3 Hz	0.3 Hz to 3 Hz	0.3 Hz to 3 Hz	0.05 Hz to 5 Hz	1 Hz to 2 Hz	1 Hz to 2 Hz	1 Hz to 3 Hz	1Hz to 2 Hz	1 Hz to 2 Hz	1 Hz to 2 Hz	0.5 Hz to 5 Hz	0.3 Hz to 3Hz	5 Hz to 7 Hz	1 Hz to 3Hz	0.14Hz typ.
Cartridge Thermal Noise (dB(A))	13.5	20	18	29.5	30.5	—	9.5	10	14.5	9.5	14.5	15	13.5	29.5	–5.5	18	20
Open Circuit Distortion Limit, 3% at 100 Hz (dB re. 20 µPa)	>142	>160	>160	>164	>172	>168	>146	>146	>146	>146	>146	>146	>142	>164	>140	>160	>160
Resonance Frequency‡ (kHz)	12.5	24	23	100	70	160	8	11	14	8.5	14	11	12.5	95	7	23	24
Polarization Voltage (V)	28	200	200	200	200	200	200	200	0	200	200	200	0	200	200	200	200
Polarized Cartridge Capacitance at 250 Hz (pF)	14	18	18.5	6.4	6.4	3.5	55	66	15	55	19	21	12.5	6.4	40	17.5	19.5
Mean Temperature Coefficient (at 250 Hz) –10°C to +50°C (dB/°C)	–0.007	–0.002	–0.002	–0.01	–0.01	–0.01	–0.003	–0.002	–0.006	–0.003	–0.007	–0.007	–0.004	–0.005	–0.004	–0.002	–0.002
Equivalent Air Volume at 250 Hz, 101.3 kPa (mm^3)	50	10	10	0.6	0.25	0.1	148	130	40	148	40	40	50	—	400	9.3	—
Influence of Static Pressure at 250 Hz (dB/kPa)	–0.02	–0.007	–0.007	–0.007	–0.003	–0.01	–0.016	–0.015	–0.01	–0.016	–0.01	–0.01	–0.02	–0.007	–0.016	–0.007	–0.007

Table 2 Comparison of most important specifications for traditional microphone range

* P = Pressure, FF = Free-field 0° Incidence, RI = Random Incidence
† Not for Random Incidence
‡ 90° phase shift of pressure characteristic

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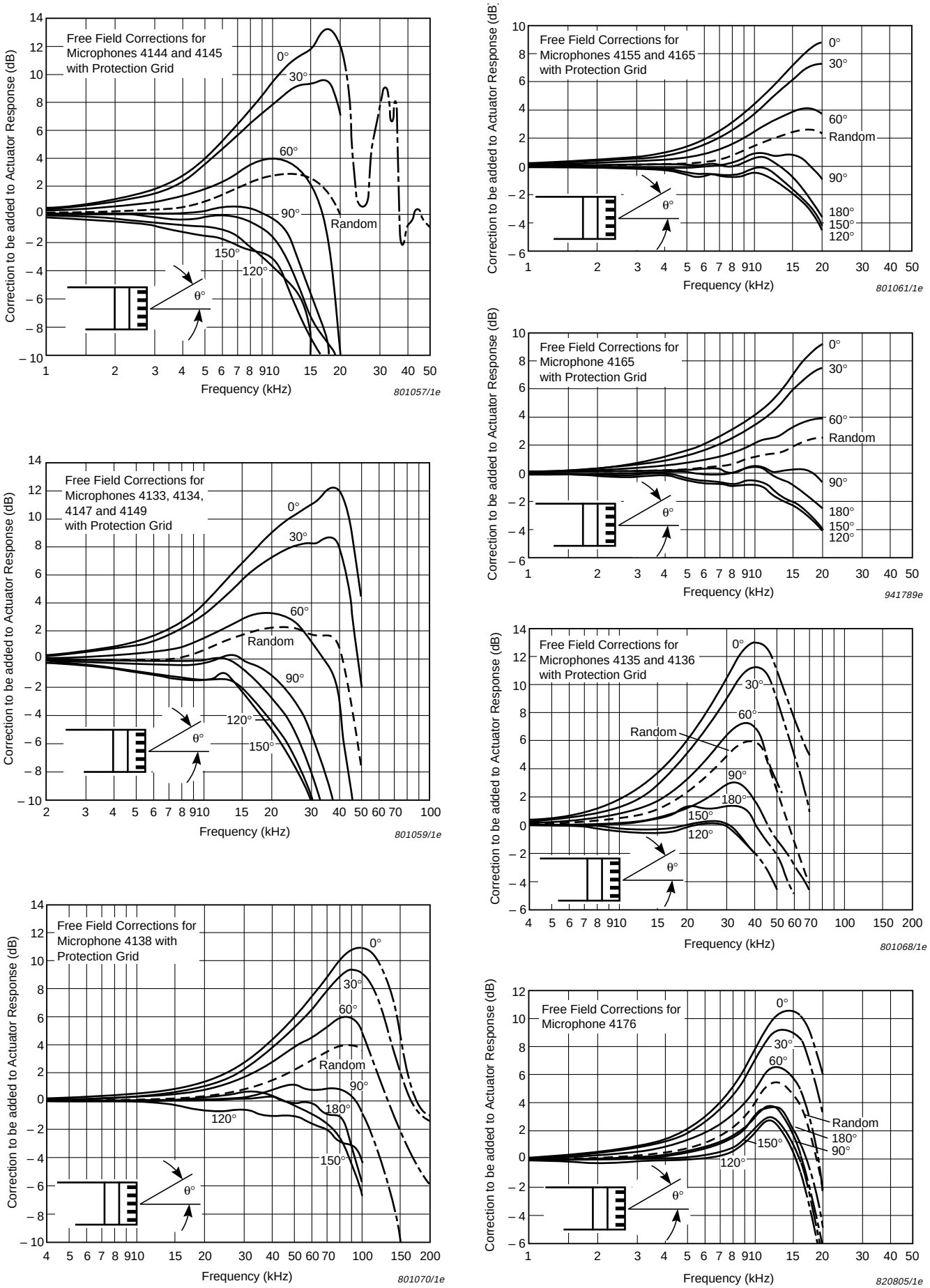

Fig.9 Free-field correction curves for the various Brüel&Kjær condenser microphones

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Specifications and Ordering Information Type 4130

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Low-cost, simple and flexible general purpose sound measurement systems

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Free-field, 0° incidence
Random-incidence (when fitted with Random-incidence Corrector DZ 9566)

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
6.5 Hz to 8 kHz: ±2 dB
5 Hz to 12.5kHz: ±3 dB
In accordance with IEC 651 Type 2
Random-Incidence Response:
In accordance with ANSI S1.4–1983, Type 2

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–40 ± 1.5 dB re.1 V/Pa, 10 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.5 Hz to 5 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
13.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>142 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
12.5 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 28 V nominal, maximum 120 V

POLARIZED CARTRIDGE CAPACITANCE*:
14 pF at 250 Hz and 28 V polarization

MAXIMUM OPERATING TEMPERATURE:
100°C (70°C with random-incidence corrector)

MEAN TEMPERATURE COEFFICIENT:
–0.007 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
50 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>250 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.02 dB/kPa, typical

INFLUENCE OF VIBRATION:
60 dB re. 20 µPa and 1 ms^{-2} axial vibration

* Individually calibrated

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

DIMENSIONS:
Diameter: 13.2 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)
14.35 mm (0.56 in) (with corrector)
Height: 14.9 mm (0.59 in)
16.7 mm (0.66 in) (with corrector)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4130 1/2" Microphone

Includes the following accessory:
DZ 9566 Random-Incidence Corrector

Preamplifier and Power Supply:
(For specifications see separate product data sheet, number BP 0020)
Type 2642 1/2" Microphone Preamplifier
Type 2810 Microphone Power Supply

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4133

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
General electroacoustic purposes, loudspeaker and microphone measurements

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTIC:
Free-field, 0° incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
4 Hz to 40 kHz: ±2 dB
In accordance with IEC 651 Type 0, Type 1 and ANSI S1.12, Type M

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–38 dB re.1 V/Pa, 12.5 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 3 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
20 dB(A)

3% DISTORTION LIMIT (UPPER):
>160 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
24 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
18 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.002 dB/°C (250 Hz, -10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
10 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>1000 years/dB at 20°C
>2 hours/dB at 150°C

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
67 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
20 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

DIMENSIONS:
Diameter: 13.2 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)
Height: 12.6 mm (0.49 in) (with grid)
11.7 mm (0.46 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4133 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4134

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Medium- and high-level measurements in the audio range and flush mounted measurements of noise. Especially suitable where good random-incidence characteristics are required

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Random-Incidence and Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
4 Hz to 20 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–38 ± 1.5 dB re. 1 V/Pa, 12.5 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 3 Hz

CARTRIDGE THERMAL NOISE:
18 dB(A)

3% DISTORTION LIMIT (UPPER):
>160 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
23 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
18.5 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.002 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
10 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>1000 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
67 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
20 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

DIMENSIONS:
Diameter: 13.2 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)
Height: 12.6 mm (0.49 in) (with grid)
11.5 mm (0.45 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4134 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4135

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
General high-level, high-frequency measurements and model work

NOMINAL DIAMETER:
1/4"

FREQUENCY RESPONSE CHARACTERISTIC:
Free-field and Random

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
4 Hz to 100 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–48 dB re. 1 V/Pa, 4 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.3 Hz to 3 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
29.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>164 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
100 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
6.4 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.01 dB/°C (250 Hz, -10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
0.6 mm^3 (250 Hz)

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
59 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 7 mm (0.27 in) (with grid)
6.35 mm (0.25 in) (without grid)
Height: 10.5 mm (0.41 in) (with grid)
9 mm (0.35 in) (without grid)
Thread for preamplifier mounting: 5.7 mm – 60 UNS

Ordering Information

Type 4135 1/4" Microphone

Suitable Preamplifiers:
Type 2633 1/4" Microphone Preamplifier

or the following with adaptor **UA 0035**:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4136

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Measurements in narrow spaces and small cavities, high-level and high-frequency measurements. Also used in flush mounted measurements

NOMINAL DIAMETER:
1/4"

FREQUENCY RESPONSE CHARACTERISTICS:
Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
4 Hz to 70 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–56 ± 1.5 dB re.1 V/Pa, 1.6 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.3 Hz to 3 Hz

CARTRIDGE THERMAL NOISE:
30.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>172 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
70 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
6.4 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.01 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
.25 mm^3 (250 Hz)

INFLUENCE OF STATIC PRESSURE:
–0.0025 dB/kPa, typical

INFLUENCE OF VIBRATION:
69 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
38 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 7 mm (0.27 in) (with grid)
6.35 mm (0.25 in) (without grid)
Height: 10.5 mm (0.41 in) (with grid)
9 mm (0.35 in) (without grid)
Thread for preamplifier mounting: 5.7 mm – 60 UNS

Ordering Information

Type 4136 1/4" Microphone

Suitable Preamplifiers:
Type 2633 1/4" Microphone Preamplifier

or the following with adaptor **UA 0035**:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4138

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
High-level and very high-frequency measurements, or for pulse measurements. Also especially suitable for applications which require a high degree of spatial resolution or where space is limited, e.g. model testing

NOMINAL DIAMETER:
1/8"

FREQUENCY RESPONSE CHARACTERISTICS:
Random-Incidence and Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
6.5 Hz to 140 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–60 ± 1.5 dB re.1 V/Pa, 1.0 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.05 Hz to 5 Hz

3% DISTORTION LIMIT (UPPER):
>168 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
160 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
3.5 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.01 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
0.1 mm^3 (250 Hz)

INFLUENCE OF STATIC PRESSURE:
–0.01 dB/kPa, typical

INFLUENCE OF VIBRATION:
58 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
40 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 3.5mm (0.14 in) (with grid)
3.175 mm (0.12 in) (without grid)
Height: 6.7mm (0.26 in) (with grid)
6 mm (0.23 in) (without grid)
Thread for preamplifier mounting: M3 x 0.2

Ordering Information

Type 4138 1/8" Microphone

Suitable Preamplifiers:
Type 2633 1/4" Microphone Preamplifier with Adaptor **UA 0160**

or the following with Adaptor **UA 0036**:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4144

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Coupler measurements, audiometer calibration, low-frequency and low-level measurements and as a laboratory standard

NOMINAL DIAMETER:
1”

FREQUENCY RESPONSE CHARACTERISTICS:
Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
2.6 Hz to 8 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–26 ± 1.5 dB re. 1 V/Pa, 50 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 2 Hz

CARTRIDGE THERMAL NOISE:
9.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
8 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
55 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.003 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
148 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>1000 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.016 dB/kPa, typical

INFLUENCE OF VIBRATION:
67 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
18 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 23.77 mm (0.92 in) (with grid)
23.77 mm (0.92 in) (without grid)
Height: 19 mm (0.74 in) (with grid)
17 mm (0.66 in) (without grid)
Thread for preamplifier mounting: 23.11 mm – 60 UNS

Ordering Information

Type 4144 1” Microphone

Suitable Preamplifiers:
Type 2639 1/2” Microphone Preamplifier with Adaptor **DB 0375**
Type 2645 1/2” Microphone Preamplifier with Adaptor **UA 0786**
Type 2660 1/2” Low-level Microphone Preamplifier with Adaptor **DB 0375**
Type 2669B 1/2” Microphone Preamplifier with Adaptor **DB 0375**
Type 2669L 1/2” Microphone Preamplifier with LEMO connector with Adaptor **DB 0375**

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4145

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Low-level measurements and laboratory use

NOMINAL DIAMETER:
1”

FREQUENCY RESPONSE CHARACTERISTIC:
Free-field, 0° incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
2.6 Hz to 18 kHz: ±2 dB
In accordance with IEC 651 Type 0, Type 1 and ANSI S1.12, Type M

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–26 dB re. 1 V/Pa, 50 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 2 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
10 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
11 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
66 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.002 dB/°C (250 Hz, -10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
130 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>1000 years/dB at 20°C
>2 hours/dB at 150°C

INFLUENCE OF STATIC PRESSURE:
–0.015 dB/kPa, typical

INFLUENCE OF VIBRATION:
67 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
18 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 23.77 mm (0.92 in) (with grid)
23.77 mm (0.92 in) (without grid)
Height: 19 mm (0.74 in) (with grid)
17 mm (0.66 in) (without grid)
Thread for preamplifier mounting: 23.11 mm – 60 UNS

Ordering Information

Type 4145 1” Microphone

Suitable Preamplifiers:
Type 2639 1/2” Microphone Preamplifier with Adaptor **DB 0375**
Type 2645 1/2” Microphone Preamplifier with Adaptor **UA 0786**
Type 2660 1/2” Low-level Microphone Preamplifier with Adaptor **DB 0375**
Type 2669B 1/2” Microphone Preamplifier with Adaptor **DB 0375**
Type 2669L 1/2” Microphone Preamplifier with LEMO connector with Adaptor **DB 0375**

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4155

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
As a sound level meter microphone

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Free Field

OPEN CIRCUIT FREQUENCY RESPONSE*:
4 Hz to 16 kHz: ±2 dB, 0° incidence in accordance with IEC 651 Type 1

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–26 ± 2 dB re.1 V/Pa, 50 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 3 Hz

CARTRIDGE THERMAL NOISE:
14.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
14 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 0 V

POLARIZED CARTRIDGE CAPACITANCE*:
15 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.006 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
40 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>400 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.01 dB/kPa, typical

INFLUENCE OF VIBRATION:
60 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
0.004 dB / %RH

DIMENSIONS:
Diameter: 13.1 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)
Height: 17.3 mm (0.67 in) (with grid)
16.2 mm (0.63 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

* Individually calibrated

Ordering Information

Type 4155 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector
Type 2671 1/2" Deltatron™ Preamplifier

Note: The polarization voltage feed to the preamplifier must be grounded and not allowed to float.

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4160

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified
See also separate Product Data Sheet, order number BP 0459, for more detailed information

TYPICAL USES:
Laboratory standard, medium- and low-frequency measurement, coupler measurements. The Type 4160 conforms to IEC 327, IEC 402, ANSI S1.12–1966 (and revisions), JIS C 5515 and IEC draft standard for 1" laboratory standard microphones type LS1 P

NOMINAL DIAMETER:
1"

FREQUENCY RESPONSE CHARACTERISTIC:
Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
Up to 8 kHz: ±1 dB

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–26.5 dB re.1 V/Pa, 47 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 2 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
9.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
8.5 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
55 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.003 dB/°C (250 Hz, -10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
148 mm^3 ±30 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>1000 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.016 dB/kPa, typical

INFLUENCE OF VIBRATION:
67 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
18 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
0.0025 dB / 100 %RH (due to variation in air stiffness)

DIMENSIONS:
Diameter: 23.77 mm (0.92 in)
Height: 19.35 mm (0.75 in) (with grid)
19 mm (0.74 in) (without grid)
Thread for preamplifier mounting: 23.11 mm – 60 UNS

Ordering Information

Type 4160 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier with Adaptor **DB 0375**
Type 2645 1/2" Microphone Preamplifier with Adaptor **UA 0786**
Type 2669B 1/2" Microphone Preamplifier with Adaptor **DB 0375**
Type 2669L 1/2" Microphone Preamplifier with LEMO connector with Adaptor **DB 0375**

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4165

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
General sound measurements, and for standardized noise measurements in accordance with IEC and ISO standards. The Type 4165 has a similar sensitivity to a 1" microphone, is more omnidirectional and may therefore be used as a substitute 1" microphone where disturbance to the sound field is to be minimised. Back venting allows the use of dehumidifier UA 0308

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Free-field, 0° incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
2.6 Hz to 20 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–26 ±1.5 dB re.1 V/Pa, 50 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 2 Hz

CARTRIDGE THERMAL NOISE:
14.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
14 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
19 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.0007 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
40 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>600 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.01 dB/kPa, typical

INFLUENCE OF VIBRATION:
60 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
0.004 dB / %RH

DIMENSIONS:
Diameter: 13.2 mm (0.51 in) (with grid)
12.7 mm (0.49 in) (without grid)
Height: 16.3 mm (0.63 in) (with grid)
15.2 mm (0.59 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4165 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4166

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
General random-incidence measurements, and for standardized noise measurements in accordance with ANSI standards. The Type 4166 has a similar sensitivity to a 1" microphone, is more omnidirectional and may therefore be used as a substitute 1" microphone where disturbance to the sound field is to be minimised. Back venting allows the use of dehumidifier UA 0308

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTIC:
Random-incidence and Pressure

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
2.6 Hz to 10kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–26 dB re.1 V/Pa, 50mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 2 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
15 dB(A)

3% DISTORTION LIMIT (UPPER):
>146 dB re. 20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
11 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
21 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.0007 dB/°C (250 Hz, -10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
40 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>600 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.01 dB/kPa, typical

INFLUENCE OF VIBRATION:
60 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
0.004 dB / %RH

DIMENSIONS:
Diameter: 13.2 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)
Height: 16.3 mm (0.63 in) (with grid)
15.2 mm (0.59 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4166 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4176

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
As a sound level meter microphone (conforms to IEC 651 Type 1 and ANSI S1.4–1983 Type 1)

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Free-field,0° Incidence and Random-incidence with corrector DZ 9566

OPEN CIRCUIT FREQUENCY RESPONSE*:
6.5 Hz to 12.5 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–26 ±2 dB re.1 V/Pa, 50 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.5 Hz to 5Hz

CARTRIDGE THERMAL NOISE:
13.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>142 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
12.5 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 0 V

POLARIZED CARTRIDGE CAPACITANCE*:
12.5 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.004 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
50 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>250 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.02 dB/kPa, typical

INFLUENCE OF VIBRATION:
60 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
30 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

DIMENSIONS:
Diameter: 13.2 mm (0.52 in) (with grid)
12.7 mm (0.50 in) (without grid)

* Individually calibrated

Height: 16.7mm (0.65 in) (with grid)
14.9 mm (0.58 in) (without grid)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4176 1/2" Microphone

Includes the following accessory:

DZ 9566 Random-incidence Corrector

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector
Type 2671 1/2" Deltatron™ Preamplifier

Note: The polarization voltage feed to the preamplifier must be grounded and not allowed to float.

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4178

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Measurement of sound intensity

NOMINAL DIAMETER:
1/4"

FREQUENCY RESPONSE CHARACTERISTIC:
Free-field 0° incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
4 Hz to 100 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–48 dB re.1 V/Pa, 4mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.3 Hz to 3 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
29.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>164 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
95 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
6.4 pF at 250 Hz

PHASE RESPONSE DIFFERENCE WHEN USED AS A PAIR:
< 0.2°: 20 Hz to 1 kHz (absolute value)

AMPLITUDE RESPONSE DIFFERENCE WHEN USED AS A PAIR:
< 0.2 dB: 20Hz to 2 kHz (normalized at 200 Hz)

MEAN TEMPERATURE COEFFICIENT:
–0.005 dB/°C (250 Hz, -10°C < t < +50°C)

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
59 dB re. 20 µPa and 1 ms^{-2} axial vibration

* Individually calibrated

INFLUENCE OF MAGNETIC FIELD:
10 to 42 dB re. 20 µPa in 50 Hz, 80 A/m field

INFLUENCE OF HUMIDITY:
<0.1 dB/100 %RH

THREAD FOR PREAMPLIFIER MOUNTING:
5.7 mm – 60 UNS

Ordering Information

Type 4178 1/2" Sound Intensity Microphone Pair

Includes the following accessories:
UC 0196 6 mm spacer
UC 0195 12 mm spacer

Suitable Preamplifiers:

Type 4178 microphones are normally included as part of Sound Intensity Probe Set Type 3545, which includes matched preamplifiers.

For information on microphone calibration equipment and microphone accessories, please refer to the product data sheet for Type 3545

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Specifications and Ordering Information Type 4179

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Measurement of very low sound levels

NOMINAL DIAMETER:
1"

FREQUENCY RESPONSE CHARACTERISTICS:
Free-field,0° Incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
10 Hz to 10 kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–20 ±2 dB re.1 V/Pa, 100 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
5 Hz to 7Hz

CARTRIDGE THERMAL NOISE:
–5.5 dB(A)

3% DISTORTION LIMIT (UPPER):
>140 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
7 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
40 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.004 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
400 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>250 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.016 dB/kPa, typical

INFLUENCE OF VIBRATION:
46 dB re. 20 µPa and 1 ms^{-2} axial vibration when connected to Type 2660 preamplifier

INFLUENCE OF MAGNETIC FIELD:
6 dB re. 20 µPa in 50 Hz, 80 A/m field when connected to Type 2660 preamplifier

INFLUENCE OF HUMIDITY:
<0.1 dB in the absence of condensation

* Individually calibrated

DIMENSIONS:
Diameter: 23.7 mm (0.93 in) (with grid)
23.7 mm (0.93 in) (without grid)
Height: 25 mm (0.98 in) (with grid)
23 mm (0.90 in) (without grid)
Thread for preamplifier mounting: 23.11 mm – 60 UNS

Ordering Information

Type 4176 1/2" Microphone

Includes the following accessory:
DZ 9025 Protective Dust Cap

Suitable Preamplifier:
Type 2660 1/2" Low-level Microphone Preamplifier

For more information on the Type 2660 preamplifier, microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

Specifications and Ordering Information Type 4180

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified
See also separate Product Data Sheet, order number BP 0459, for more detailed information

TYPICAL USES:
Laboratory standard, coupler measurements. The Type 4180 conforms to IEC draft standard for 1/2" laboratory standard microphones type LS2a P

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTICS:
Pressure Response

OPEN CIRCUIT FREQUENCY RESPONSE*:
Up to 20 kHz: ±1.5 dB

OPEN CIRCUIT SENSITIVITY (250 Hz)*:
–38 ±1.5 dB re.1 V/Pa, 12.5 mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
1 Hz to 3 Hz

CARTRIDGE THERMAL NOISE:
18 dB(A)

3% DISTORTION LIMIT (UPPER):
>160 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
23 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
17.5 pF at 250 Hz

MEAN TEMPERATURE COEFFICIENT:
–0.002 dB/°C (-10°C < t < +50°C)

EQUIVALENT AIR VOLUME:
9.3 mm^3 (250 Hz)

EXPECTED LONG-TERM STABILITY:
>400 years/dB at 20°C

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
65 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
20 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
0.0008 dB / 100% RH (due to variation in air stiffness)

DIMENSIONS:
Diameter: 13.2 mm (0.52 in)
Height: 12.0 mm (0.47 in)
Thread for preamplifier mounting: 11.7 mm – 60 UNS

Ordering Information

Type 4180 1/2" Microphone

Suitable Preamplifiers:
Type 2639 1/2" Microphone Preamplifier
Type 2645 1/2" Microphone Preamplifier
Type 2660 1/2" Low-level Microphone Preamplifier
Type 2669B 1/2" Microphone Preamplifier
Type 2669L 1/2" Microphone Preamplifier with LEMO connector

For information on microphone calibration equipment and microphone accessories, please refer to the relevant product data sheets

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Specifications and Ordering Information Type 4181

The data below are valid at 23°C, 101.3 kPa and 50% RH unless otherwise specified

TYPICAL USES:
Measurement of sound intensity

NOMINAL DIAMETER:
1/2"

FREQUENCY RESPONSE CHARACTERISTIC:
Free-field 0° incidence

OPEN CIRCUIT FREQUENCY RESPONSE*:
0° incidence free-field response:
0.3 Hz to 16kHz: ±2 dB

OPEN CIRCUIT SENSITIVITY (1000 Hz)*:
–39 dB re.1 V/Pa, 11.2mV/Pa

LOWER LIMITING FREQUENCY (-3 dB):
0.14 Hz (vent exposed to sound)

CARTRIDGE THERMAL NOISE:
20 dB(A)

3% DISTORTION LIMIT (UPPER):
>160 dB re.20 µPa at 100 Hz

DIAPHRAGM RESONANCE FREQUENCY:
24 kHz (90° phase-shift)

POLARIZATION VOLTAGE:
External: 200 V

POLARIZED CARTRIDGE CAPACITANCE*:
19.5 pF at 250 Hz

PHASE RESPONSE DIFFERENCE WHEN USED AS A PAIR:
< 0.05°: 20 Hz to 250 Hz (absolute value)

AMPLITUDE RESPONSE DIFFERENCE WHEN USED AS A PAIR:
< 0.2 dB: 20Hz to 1 kHz (normalized at 200 Hz)

MEAN TEMPERATURE COEFFICIENT:
–0.002 dB/°C (250 Hz, -10°C < t < +50°C)

INFLUENCE OF STATIC PRESSURE:
–0.007 dB/kPa, typical

INFLUENCE OF VIBRATION:
68 dB re. 20 µPa and 1 ms^{-2} axial vibration

INFLUENCE OF MAGNETIC FIELD:
6 to 34 dB re. 20 µPa in 50 Hz, 80 A/m field

* Individually calibrated

INFLUENCE OF HUMIDITY:
< 0.1 dB/100 %RH

THREAD FOR PREAMPLIFIER MOUNTING:
5.7 mm – 60 UNS

Ordering Information

Type 4181 1/2" Sound Intensity Microphone Pair

Includes the following accessories:

UC 5349	8.5 mm spacer
UC 5269	12 mm spacer
UC 5270	50 mm spacer

Suitable Preamplifiers:

Type 4181 microphones are normally included as part of Sound Intensity Probe Sets Type 3545 and Type 3548, which include matched preamplifiers.

For information on microphone calibration equipment and microphone accessories, please refer to the product data sheet for Type 3545 and Type 3548

Brüel&Kjær reserves the right to change specifications and accessories without notice

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