Product Data

The Falcon™ Range 1/2″ Microphones — Types 4188 to 4193

USES:

- ❍ For sound level meters
- ❍ In noise measurement systems satisfying IEC and ANSI standards
- ❍ Transport-noise measurements
- ❍ Architectural acoustics
- ❍ Electro-acoustics

FEATURES:

- ❍ Choice of free or pressure-field frequency response
- ❍ Choice of pre- or external polarization
- ❍ Wide dynamic ranges typically from 14.2 dB(A) to 146 dB and 20 dB(A) to 162 dB (3% distortion limit)
- ❍ Very wide operating temperature range and low ambient-temperature coefficient
- ❍ Individual calibration charts
- ❍ Individual data disks for Types 4189 to 4193 for use with Microsoft® Windows™
- ❍ Withstand IEC 68-2-32 1 m drop test (<0.1 dB sensitivity change) and industrial environments
- ❍ Falcon™ Range product with a three-year guarantee

The Falcon™ Range microphones are six new high-quality, 1/2″ diameter precision condenser microphones. They cover requirements for free-, random- and pressure-field measurements. They are the latest in Brüel & Kjær's range of precision microphones for accurate and reliable electro-acoustic, IEC or ANSI sound measurements. Their corrosion resistance has been improved and their temperature range has been extended. They are the result of a new and robust design which ensures greater reliability and accuracy.

Introduction

The six 1/2″ condenser microphones of Brüel & Kjær's Falcon™ Range cover, between them, a very wide range of needs and applications.

They are the culmination of 40 years of leadership in top quality condenser microphones for precision acoustic measurements. These Falcon™ Range microphones will meet your demands whether they be in complying with ANSI or IEC standards or in acoustic research.

Robust and Stable

They are robust and suffer less than a ±0.1 dB change in sensitivity when subjected to an IEC 68-2-32 1 m drop test onto a hard wooden block. They are made of carefully selected materials and alloys to ensure excellent stability and are virtually unaffected by industrial and similarly hostile environments. Furthermore, each Falcon™ Range microphone comes with an extended guarantee period of three years.

During manufacture, each microphone is artificially aged at a high temperature to ensure good long-term stability.

No ecologically damaging materials are used in the manufacture and packaging of these microphones. The Types 4189 to 4193 are packaged as shown above.

Selecting a Microphone for Your Needs

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

Standards (IEC or ANSI)
Free- or pressure-field response
Frequency range
Polarization (0 V or 200 V)

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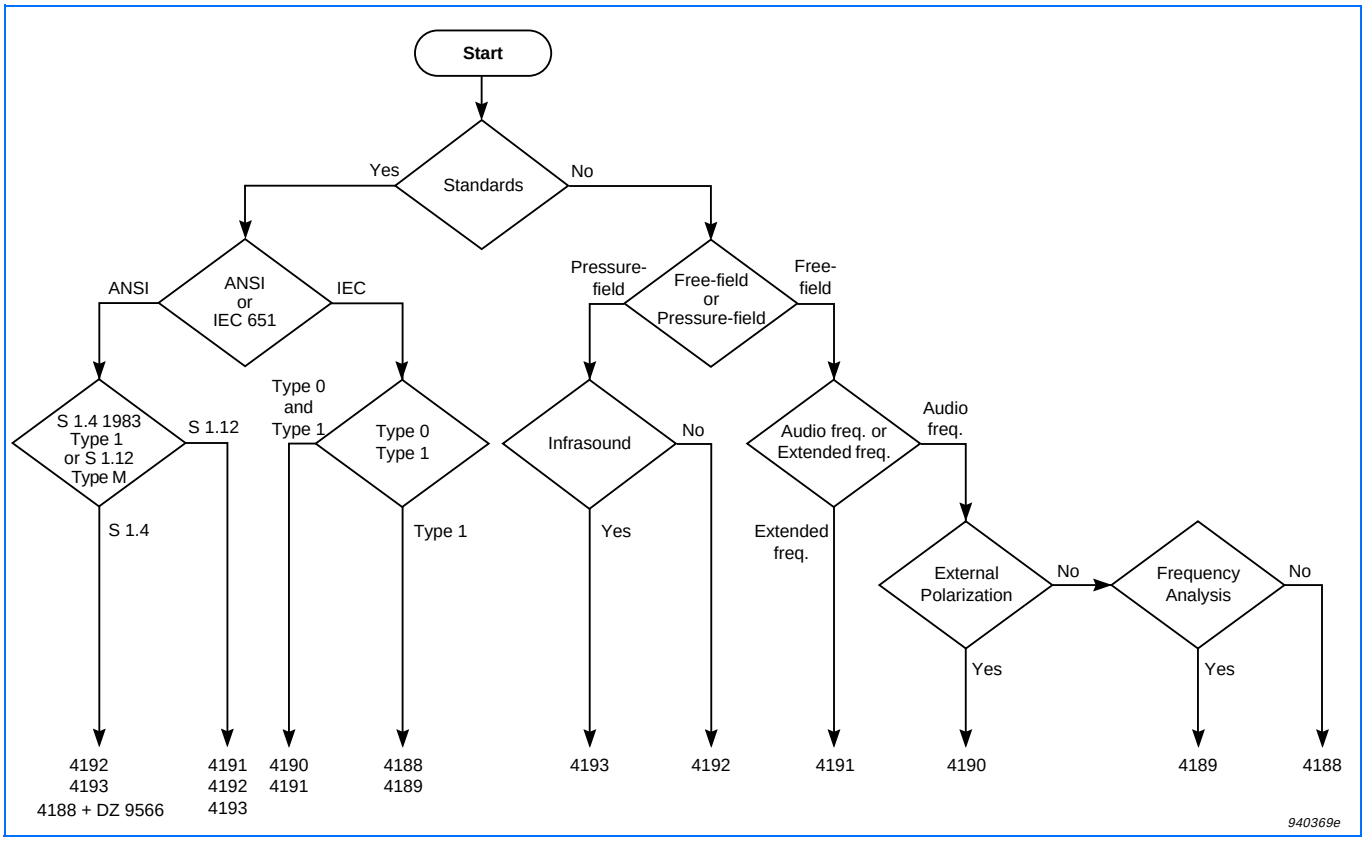

Fig. 1 Flow chart to help you choose the right microphone from the Falcon™ Range for your needs

These factors, together with the flow chart shown in Fig. 1, will help you to make the right decision.

Measurement Standards

You can use these microphones in noise measurement systems satisfying either ANSI or IEC standards (or their local equivalents). The microphones use 50% to 70% of the tolerances allowed by these standards.

Frequency Ranges

All six microphones cover the audio frequency range. If, however, you want to measure at frequencies down to 0.05 Hz (for infrasound measurements), choose the Type 4193, or at frequencies up to 40 kHz (for harmonic distortion measurements on loudspeakers) choose the Type 4191.

Polarization/Preamplifier

Prepolarized microphones are required on certain portable sound level meters (which do not provide external polarization) and are a good choice in tough and humid environments. Externally polarized microphones are more stable even at high temperatures. All six can be used with the $^1/_2$″ Microphone Preamplifier Type 2669. The two prepolarized microphones can also be used with the Preamplifier Type 2671.

Free-field Response or Pressure-field Response

The four free-field response microphones (Types 4188 to 4191) cover specific IEC requirements and should be used in sound fields where reflections are negligible. The two pressure-field response microphones (Types 4192 and 4193) should be used for measurements in acoustic couplers. They also cover specific ANSI requirements and can be used in diffuse sound fields.

As Replacements for Earlier Brüel&Kjær Microphones

Table 1 shows what earlier Brüel & Kjær microphones can be replaced (type approval permitting) by Falcon™ Range microphones.

Earlier Microphones	Falcon™ Range Mics.
4155	4189
4165	4190
4133/4149	4191
4134	4192
4147	4193
4166	(4188/4190/4192)*
4176	(4188/4189)*

*Table 1 Replacement check for earlier Brüel & Kjær microphones. The * means these are not direct replacements*

Prepolarized Free-field $^1/_2$″ Microphones Types 4188 and 4189

These are prepolarized, free-field microphones which differ mainly in frequency range and sensitivity. Both can be used for measurements in accordance with IEC 651 Type 1. The Type 4188 is also suited to ANSI S 1.4 – 1983 Type 1 measurements when fitted with the Random-incidence Corrector DZ 9566 supplied. If your measurements require only frequency weighting (A or C), the Type 4188 is the more economic choice, and is also more robust. The Type 4189 has a greater sensitivity and frequency range and is well suited to general sound measurements requiring frequency analysis.

They offer some significant advantages when used with portable, low-power instruments not designed to produce a polarization voltage. Another advantage is greater reliability of the associated preamplifier under humid and polluted conditions. These factors make these prepolarized condenser microphones particularly suitable for field measurements, both outdoors and in industrial environments.

Prepolarization
They are prepolarized by a fixed, negatively charged layer deposited on the backplate of the microphone. If, however, an external polarization voltage is mistakenly applied, no permanent damage will occur because this will cause the backplate to repel the microphone's diaphragm.

The housing of these prepolarized microphones are marked by a pair of parallel grooves.

Static Pressure Equalization
Table 2 tells you how each microphone is vented for static pressure equalisation. In brief, tall microphones are rear vented and short microphones are side vented. Rear venting permits the use of the Dehumidifier UA 0308 for operation in especially humid environments.

Type	Housing	Venting
4188/4189/ 4190	Tall	Rear
4191/4192/ 4193	Short	Side

Table 2 Static pressure equalisation

Free-field 1/2″ Microphones Types 4190 and 4191

These are externally polarized, free-field microphones which differ mainly in frequency range and sensitivity. The polarization voltage required is 200 V and is provided by the instrument or analyzer powering the associated preamplifier.

Both can be used for noise measurements in accordance with the more stringent requirements of IEC 651 Type 0 (and off course Type 1).

Free-field 1/2″ Microphone Type 4190
Has greater sensitivity and low inherent noise. Its frequency range is from 3.15 Hz to 20 kHz and is very well suited for a wide range of precision audio-frequency sound measurements.

Free-field 1/2″ Microphone Type 4191
Has an extended frequency range which is from 3.15 Hz to 40 kHz. This makes it very well suited for electro-acoustic measurements on loudspeakers and microphones as well as for general precision sound measurements.

Pressure-field 1/2″ Microphones Types 4192 and 4193

These are externally polarized, pressure-field microphones which differ only in frequency range. The polarization voltage required is 200 V and is provided by the instrument or analyzer powering the associated preamplifier.

Both can be used for noise measurements in accordance with the requirements of ANSI S 1.4 1983 Type 1 and ANSI S 1.12 Type M. Note: the sensitivity of the Type 4193 to low frequencies can be a disadvantage if you do not need to measure at low frequencies.

Pressure-field 1/2″ Microphone Type 4192
Has a frequency range from 3.15 Hz to 20 kHz. It can be used either for ANSI S 1.4 sound measurements requiring random-incidence response or for coupler measurements, e.g. in connection with telephone and hearing aid testing. Furthermore, it also satisfies the requirements of ANSI S 1.12 Type M.

Pressure-field 1/2″ Microphone Type 4193 and Low-frequency Adaptor UC0211
Has an extended low-frequency range which cuts off between 10 mHz and 50 mHz. The high end of its frequency range extends up to 20 kHz. In addition to random-field or coupler measurements, it can also be used for measuring infrasound, for example, in ships' engine rooms, in helicopters and in wind-buffeted buildings.

This microphone is supplied with a special Low-frequency Adaptor UC 0211 which has the effect of reducing the lower cut-off frequency of the preamplifier. In the case of the 1/2″ Microphone Preamplifier Type 2669, down to 0.1 Hz. It also has the effect of reducing the microphone's sensitivity by 16 dB (from 12.5 to 2 mV/Pa, or from –38 to –54 dB re 1V/Pa), increasing the thermal noise from 19.0 dB (A) to 29.0 dB (A) and reducing the 3% distortion limit from 162 dB to 148 dB.

Microphone	Response	Sensitivity	Frequency Range	Polarization	Main Standards
Type 4188	Free- and diffuse-fields	31.6 mV/Pa	8 Hz to 12.5 kHz	0 V (prepolarized)	IEC 651 Type 1, ANSI S1.4 1983
Type 4189	Free-field	50 mV/Pa	6.3 Hz to 20 kHz	0 V (prepolarized)	IEC 651 Type 1
Type 4190	Free-field	50 mV/Pa	3.15 Hz to 20 kHz	200 V	IEC 651 Type 0/1
Type 4191	Free-field	12.5 mV/Pa	3.15 Hz to 40 kHz	200 V	IEC 651 Type 0/1, ANSI S1.12 Type M
Type 4192	Pressure-field	12.5 mV/Pa	3.15 Hz to 20 kHz	200 V	ANSI S1.4 Type 1, ANSI S1.12 Type M
Type 4193	Infrasound, Press.-field	12.5 mV/Pa	70 mHz to 20 kHz	200 V	ANSI S1.4 Type 1, ANSI S1.12 Type M

Microphone	Thermal Noise	LLF (–3 dB)	3% Distortion Limit	Temperature Coeff.	Max. Operating Temp.
Type 4188	14.2 dB (A), 14.5 dB (Lin)	1 Hz to 5 Hz	146 dB	+0.005 dB/°C	125 °C (257 °F) (70 °C (158 °F) with corrector)
Type 4189	14.6 dB (A), 15.3 dB (Lin)	2 Hz to 4 Hz	146 dB	–0.001 dB/×°C	150 °C (302 °F)
Type 4190	14.6 dB (A), 15.3 dB (Lin)	1 Hz to 2 Hz	148 dB	–0.007 dB/×°C	
Type 4191	20.0 dB (A), 21.4 dB (Lin)	1 Hz to 2 Hz	162 dB	–0.002 dB/×°C	150 °C (302 °F) (can be used up to 300 °C (572 °F) but with a permanent sensitivity change of typically +0.4 dB which stabilises after one hour)
Type 4192	19.0 dB (A), 21.3 dB (Lin)	1 Hz to 2 Hz	162 dB	–0.002 dB/×°C	
Type 4193 (no UC 0211)	19.0 dB (A), 21.3 dB (Lin)	10 mHz to 50 mHz	162 dB	–0.002 dB/×°C	

Table 3 An overall view of the most important open-circuit characteristics of each microphone (LLF means lower-limiting frequency)

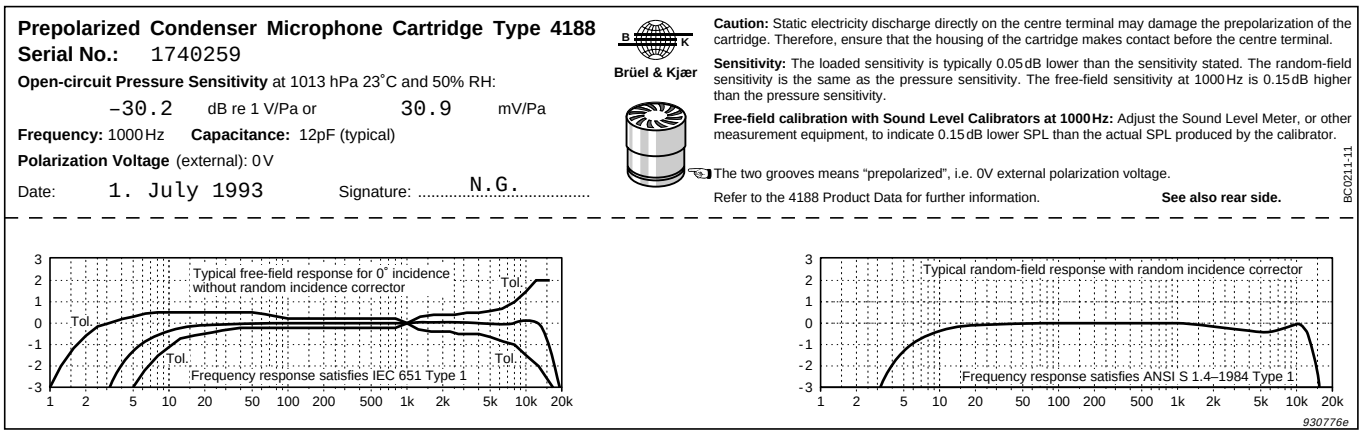

Fig. 2 An example of a Calibration Chart (front and rear sides) supplied with a Prepolarized Condenser Microphone Type 4188

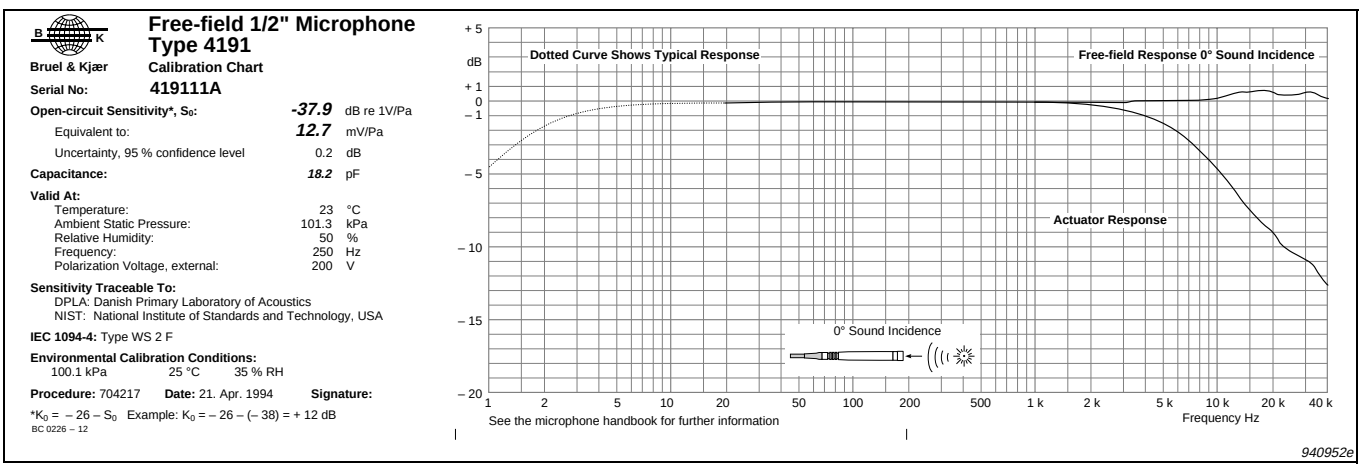

Fig. 3 An example of a Calibration Chart supplied with a Free-field 1/2" Microphone Type 4191

Microphone Specifications

The design and construction of each microphone results in a reliable transducer of high sensitivity and low temperature dependence. All data given for each microphone in this data sheet are for open-circuit conditions, which means that the microphone looks into an infinitely high impedance. Table 3 summarises the most important specifications for the Falcon™ Range microphones. In practice, however, a microphone is used with a preamplifier which slightly influences the given responses. When you use a Brüel & Kjær preamplifier (for example the Type 2669), the input impedance is very high (high resistance, low capacitance), and the loading on the microphone cartridge is generally insignificant.

More information on these microphones and other Falcon™ Range products is given in the optionally available Microphone Handbook BA 5105.

Individual Calibration Chart

The calibration chart delivered with each microphone contains all the individual parameters required for correct use of the microphone.

Typical frequency response curves are given for the Type 4188 as shown in Fig. 2. Individual frequency response curves are given for the other microphones. See the example shown in Fig. 3 for a Type 4191.

For free-field microphones, the 0° incidence free-field response is obtained by adding the 0° incidence free-field correction to the electrostatic actuator response. If required, you can use an electrostatic actuator to recalibrate the frequency response of all these microphones.

For general routine calibration you can check the sensitivity at 1 kHz with the Sound Level Calibrator Type 4231, or at 250 Hz with the Pistonphone Type 4228. For a thorough calibration the Multifunction Acoustic Calibrator Type 4226 allows you to measure both sensitivity and frequency response. Separate data sheets are available for all three of these products.

Charge-injection Calibration

This is a patented feature of Brüel & Kjær's 1/2″ Microphone Preamplifier Type 2669. It allows you to verify the condition of the microphone as well as the preamplifier and cable. This means remote calibration as well as fault detection in the entire measurement set up including the microphone.

Microphone-data Disk

Apart from Type 4188, each microphone is supplied with a 3 1/2″ microphone-data disk. This disk carries all individual calibration data as well as free-field, random-incidence and pressure-field corrections in comma-separated ASCII text files.

The disk can be fully exploited if you have a suitable drive on a PC loaded with Microsoft® Windows™.

Frequency responses (or corrections) are displayed in both graphical and tabular form. The tabular data can be printed out and stored in new files for further use. They can also be accessed by a suitable spreadsheet for further processing.

Help in the form of hypertext is included throughout to guide you.

Specifications 4188

OPEN-CIRCUIT SENSITIVITY (1000 Hz):
–30 dB ±2 dB re 1 V/Pa, 31.6 mV/Pa*
POLARIZATION VOLTAGE (external): 0 V
FREQUENCY RESPONSE:
0° incidence free-field response:
±1 dB, 12.5 Hz to 8 kHz
±2 dB, 8 Hz to 12.5 kHz
In accordance with IEC 651, Type 1 and ANSI S1.4 – 1983
LOWER LIMITING FREQUENCY (–3 dB):
1 Hz to 5 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Rear vented
DIAPHRAGM RESONANCE FREQUENCY:
9 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 1000 Hz): 12 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
65 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
208 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): +0.02 dB
CARTRIDGE THERMAL NOISE:
14.2 dB (A), 14.5 dB (Lin.)

* Individually calibrated

UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >146 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
157 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +125 °C (–22 to +257 °F)
Max. 70 °C (158 °F) when fitted with Random-incidence Corrector DZ 9566
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to +158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
+0.005 dB/°C (for the range –10 to +50 °C (14 to +122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.021 dB/kPa
INFLUENCE OF HUMIDITY: <0.1 dB/100 %RH
VIBRATION SENSITIVITY (<1000 Hz):
63.5 dB equivalent SPL for 1 m/s^2 axial acceleration

MAGNETIC FIELD SENSITIVITY:
7 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>1000 years/dB (dry air at 20 °C (68 °F))
>10 hours/dB (dry air at 125 °C (257 °F))
>40 years/dB (air at 20 °C (68 °F), 90% RH)
>6 months/dB (air at 50 °C (122 °F), 90% RH)

Dimensions

Diameter: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (cartridge housing)
14.35 mm (0.56″) (with DZ 9566)
Height: 14.9 mm (0.59″) (with grid)
14.0 mm (0.55″) (without grid)
16.7 mm (0.66″) (with DZ 9566)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4188

Type 4188 Prepolarized Free-field 1/2″ Microphone
Includes the following accessories:
DZ 9566: Random-incidence Corrector
BC 0211: Calibration Chart*

* Quote mic. serial number when re-ordering

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator
Type 4228: Pistonphone
UA 0308: Dehumidifier
UA 0254: Set of 6 Windscreens (UA 0237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications 4189

OPEN-CIRCUIT SENSITIVITY (250 Hz):
–26 dB ±1.5 dB re 1 V/Pa, 50 mV/Pa*
POLARIZATION VOLTAGE (external): 0 V
FREQUENCY RESPONSE*:
0° incidence free-field response:
±1 dB, 10 Hz to 8 kHz
±2 dB, 6.3 Hz to 20 kHz
In accordance with IEC 651, Type 1
LOWER LIMITING FREQUENCY (–3 dB):
2 Hz to 4 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Rear vented
DIAPHRAGM RESONANCE FREQUENCY:
14 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 250 Hz): 14 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
46 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
260 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): 0.00 dB
CARTRIDGE THERMAL NOISE:
14.6 dB (A), 15.3 dB (Lin.)

* Individually calibrated

UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >146 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
158 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +150 °C (–22 to 302 °F)
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to 158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
–0.001 dB/°C (for the range –10 to +50 °C (14 to 122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.010 dB/kPa
INFLUENCE OF HUMIDITY:
<0.1 dB/100 %RH
VIBRATION SENSITIVITY (<1000 Hz):
62.5 dB equivalent SPL for 1 m/s^2 axial acceleration

MAGNETIC FIELD SENSITIVITY:
6 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>1000 years/dB (dry air at 20 °C (68 °F))
>2 hours/dB (dry air at 150 °C (302 °F))
>40 years/dB (air at 20 °C (68 °F), 90% RH)
>1 year/dB (air at 50 °C (122 °F), 90% RH)

Dimensions

Diameter: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (without grid)
Height: 17.6 mm (0.69″) (with grid)
16.3 mm (0.64″) (without grid)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4189

Type 4189 Prepolarized Free-field 1/2″ Microphone
Includes the following accessories:
BC 0224: Calibration Chart*

* Quote mic. serial number when re-ordering

BC 5002: Microphone-data Disk*

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator
Type 4228: Pistonphone
UA 0308: Dehumidifier
UA 0254: Set of 6 Windscreens (UA 0237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications 4190

OPEN-CIRCUIT SENSITIVITY (250 Hz):
–26 dB ±1.5 dB re 1 V/Pa, 50 mV/Pa*
POLARIZATION VOLTAGE (external): 200 V
FREQUENCY RESPONSE*:
0° incidence free-field response:
±1 dB, 5 Hz to 10 kHz
±2 dB, 3.15 Hz to 20 kHz
In accordance with IEC 651, Type 0 and Type 1
LOWER LIMITING FREQUENCY (–3 dB):
1 Hz to 2 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Rear vented
DIAPHRAGM RESONANCE FREQUENCY:
14 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 250 Hz)*: 16 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
46 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
250 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): 0.00 dB

* Individually calibrated

CARTRIDGE THERMAL NOISE:
14.6 dB (A), 15.3 dB (Lin.)
UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >148 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
159 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +150 °C (–22 to +302 °F)
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to 158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
–0.007 dB/°C (for the range –10 to +50 °C (14 to 122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.010 dB/kPa
INFLUENCE OF HUMIDITY:
<0.1 dB/ 100 %RH

VIBRATION SENSITIVITY (<1000 Hz):
62.5 dB equivalent SPL for 1 m/s^2 axial acceleration
MAGNETIC FIELD SENSITIVITY:
4 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>1000 years/dB at 20 °C (68 °F)
>100 hours/dB at 150 °C (302 °F)

Dimensions

Diameter: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (without grid)
Height: 17.6 mm (0.69″) (with grid)
16.3 mm (0.64″) (without grid)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4190

Type 4190 Free-field 1/2″ Microphone
Includes the following accessories:
BC 0225: Calibration Chart*
BC 5002: Microphone-data Disk*

* Quote mic. serial number when re-ordering

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator
Type 4228: Pistonphone

UA 0308: Dehumidifier
UA 0254: Set of 6 Windscreens (UA 0237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications 4191

OPEN-CIRCUIT SENSITIVITY (250 Hz):
–38 dB ±1.5 dB re 1 V/Pa, 12.5 mV/Pa*
POLARIZATION VOLTAGE (external): 200 V
FREQUENCY RESPONSE*:
0° incidence free-field response:
5 Hz to 16 kHz ±1 dB
3.15 Hz to 40 kHz ±2 dB
In accordance with IEC 651, Type 0, Type 1 and ANSI S1.12, Type M
LOWER LIMITING FREQUENCY (–3 dB):
1 Hz to 2 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Side vented
DIAPHRAGM RESONANCE FREQUENCY:
34 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 250 Hz)*: 18 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
11.6 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
190 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): +0.02 dB

* Individually calibrated

CARTRIDGE THERMAL NOISE:
20.0 dB (A), 21.4 dB (Lin.)
UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >162 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
171 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +150 °C (–22 to 302 °F)
(can be used up to +300 °C (572 °F), but with a permanent sensitivity change of typically +0.4 dB which stabilises after one hour)
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to 158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
–0.002 dB/°C (for the range –10 to +50 °C (14 to 122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.007 dB/kPa

INFLUENCE OF HUMIDITY: <0.1 dB/100 %RH
VIBRATION SENSITIVITY (<1000 Hz):
65.5 dB equivalent SPL for 1 m/s^2 axial acceleration
MAGNETIC FIELD SENSITIVITY:
16 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>1000 years/dB at 20 °C (68 °F)
>100 hours/dB at 150 °C (302 °F)

Dimensions

Diameter: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (without grid)
Height: 13.5 mm (0.53″) (with grid)
12.6 mm (0.50″) (without grid)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4191

Type 4191 Free-field 1/2″ Microphone
Includes the following accessories:
BC 0226: Calibration Chart*
BC 5002: Microphone-data Disk*

* Quote mic. serial number when re-ordering

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator
Type 4228: Pistonphone

UA 0254: Set of 6 Windscreens (UA 237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications 4192

OPEN-CIRCUIT SENSITIVITY (250 Hz):
–38 dB ±1.5 dB re 1 V/Pa, 12.5 mV/Pa*
POLARIZATION VOLTAGE (external): 200 V
FREQUENCY RESPONSE*:
Pressure-field response:
5 Hz to 7 kHz: ±1 dB
3.15 Hz to 20 kHz: ±2 dB
In accordance with ANSI S1.4 -1983, Type 1 and ANSI S1.12, Type M
LOWER LIMITING FREQUENCY (–3 dB):
1 Hz to 2 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Side vented
DIAPHRAGM RESONANCE FREQUENCY:
23 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 250 Hz)*: 18 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
8.8 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
190 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): +0.02 dB

* Individually calibrated

CARTRIDGE THERMAL NOISE:
19.0 dB (A), 21.3 dB (Lin.)
UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >162 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
171 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +150 °C (–22 to 302 °F)
(can be used up to +300 °C (572 °F), but with a permanent sensitivity change of typically +0.4 dB which stabilises after one hour)
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to 158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
–0.002 dB/°C (for the range –10 to +50 °C (14 to 122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.005 dB/kPa

INFLUENCE OF HUMIDITY: <0.1 dB/100% RH
VIBRATION SENSITIVITY (<1000 Hz):
65.5 dB equivalent SPL for 1 m/s^2 axial acceleration
MAGNETIC FIELD SENSITIVITY:
16 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>1000 years/dB at 20 °C (68 °F)
>100 hours/dB at 150 °C (302 °F)

Dimensions

Diameter: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (without grid)
Height: 13.5 mm (0.53″) (with grid)
12.6 mm (0.50″) (without grid)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4192

Type 4192 Pressure-field 1/2″ Microphone
Includes the following accessories:
BC 0227: Calibration Chart*
BC 5002: Microphone-data Disk*

* Quote mic. serial number when re-ordering

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator
Type 4228: Pistonphone

UA 0254: Set of 6 Windscreens (UA 0237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications 4193

OPEN-CIRCUIT SENSITIVITY (250 Hz):
–38 dB ±1.5 dB re 1 V/Pa, 12.5 mV/Pa*
–54 dB ±1.5 dB re 1 V/Pa, 1.8 mV/Pa with UC 0211
POLARIZATION VOLTAGE (external): 200 V
FREQUENCY RESPONSE*:
Pressure-field response:
0.12 Hz to 7 kHz ±1 dB
0.07 Hz to 20 kHz ±2 dB
0.13 Hz to 20 kHz ±2 dB with UC 0211
In accordance with ANSI S1.4 – 1983, Type 1 and ANSI S1.12, Type M
LOWER LIMITING FREQUENCY (–3 dB):
0.01 Hz to 0.05 Hz (vent exposed to sound)
PRESSURE EQUALIZATION VENT:
Side vented
DIAPHRAGM RESONANCE FREQUENCY:
23 kHz (90° phase shift)
CAPACITANCE (POLARIZED, 250 Hz)*: 18 pF
EQUIVALENT AIR VOLUME (101.3 kPa):
8.8 mm^3
CALIBRATOR LOAD VOLUME (250 Hz):
190 mm^3
PISTONPHONE TYPE 4228 CORRECTION (with DP 0776): +0.02 dB

* Individually calibrated

CARTRIDGE THERMAL NOISE:
19.0 dB (A), 21.3 dB (Lin.)
UPPER LIMIT OF DYNAMIC RANGE (3% distortion): >162 dB SPL
MAXIMUM SOUND PRESSURE LEVEL:
171 dB (peak)

Environmental

OPERATING TEMPERATURE RANGE:
–30 to +150 °C (–22 to +302 °F)
(can be used up to +300 °C (572 °F), but with a permanent sensitivity change of typically +0.4 dB which stabilises after one hour)
OPERATING HUMIDITY RANGE:
0 to 100 % RH (without condensation)
STORAGE TEMPERATURE:
–30 to +70 °C (–22 to +158 °F)
Data Disk: 5 to 50 °C (41 to +122 °F)
TEMPERATURE COEFFICIENT (250 Hz):
–0.002 dB/°C (for the range –10 to +50 °C (14 to 122 °F))
PRESSURE COEFFICIENT (250 Hz):
–0.005 dB/kPa
INFLUENCE OF HUMIDITY:
>1000 years/dB at 20 °C (68 °F)

<0.001 dB/100% RH
VIBRATION SENSITIVITY (<1000 Hz):
65.5 dB equivalent SPL for 1 m/s^2 axial acceleration
MAGNETIC FIELD SENSITIVITY:
16 dB SPL for 80 A/m, 50 Hz field
ESTIMATED LONG-TERM STABILITY:
>100 hours/dB at 150 °C (302 °F)

Dimensions

Diam.: 13.2 mm (0.52″) (with grid)
12.7 mm (0.50″) (without grid)
Height: 13.5 mm (0.53″) (with grid)
12.6 mm (0.50″) (without grid)
27.6 mm (1.09″) (with UC 0211 and grid)
26.7 mm (1.05″) (with UC 0211, no grid)
Thread for preamplifier mounting:
11.7 mm – 60 UNS

Note: All values are typical at 23 °C (73.4 °F) 101.3 kPa and 50% RH, unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

Ordering Information 4193

Type 4193 Pressure-field 1/2″ Microphone
Includes the following accessories:
BC 0228: Calibration Chart*
BC 5002: Microphone-data Disk*

* Quote mic. serial number when re-ordering

UC 0211: Low-frequency Adaptor

Optional Accessories

Type 2669: 1/2″ Microphone Preamplifier
Type 4231: Sound Level Calibrator
Type 4226: Multifunction Acoustic Calibrator

Type 4228: Pistonphone
UA 0254: Set of 6 Windscreens (UA 0237), 90 mm (3.5″)
UA 0469: Set of 6 Windscreens (UA 0459), 65 mm (2.6″)
BA 5105: Microphone Handbook

Specifications UC 0211 (supplied with Type 4193)

LOWER CUT-OFF FREQUENCY:
0.1 Hz (with $^1/_2$″ Microphone Preamplifier Type 2669)
EFFECT ON HIGH FREQUENCY RESPONSE:
±0.1 dB, 100 Hz to 10 kHz
±0.5 dB, 100 Hz to 20 kHz
ATTENUATION: 16 dB

CAPACITANCE (at 1000 Hz): 100 pF

Dimensions:

Diameter: 12.7 mm (0.50″)
Height: 14.1 mm (0.56″)

Thread for Preamplifier and Microphone Mounting: 11.7 mm – 60 UNS

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

Brüel & Kjær

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